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THE AMERICAN ARCHITECT AND BUILDING NEWS

VOL. XXII. REGULAR EDITION NO. 624.

ARCHITECTURE

ENGINEERING

DECORATION

CONSTRUCTION

TICKNOR & COMPANY

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REVIEW OF THE PRINCIPLES OF SANITARY PLUMBING AS NOW ACCEPTED BY ALL LEADING SANITARIANS.

THE main object to be attained is the complete removal of waste matters from the premises the instant they are generated. This can only be accomplished by observing the following rules:—(1.) Avoid all cesspools. (2.) Make all waste-passages as small as possible to effect their purposes. (3.) Construct every fixture on the principle of the flush-tank. (4.) Make every trap seal-retaining and self-scouring. (5.) Make all joints tight. (6.) Select the simplest appliances and the simplest system consistent with safety. These rules are self-evident enough to be accepted as plumbing axioms, and are sufficient to produce perfect work. The "Sanitas" Appliances have been constructed with a view to their fulfilment in every respect, and an examination of the steps leading to the development of these appliances will best illustrate the principles of Sanitary Plumbing, showing the faults which should be avoided, and the objects which should be sought.

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Considering next the Lavatory. These should always be constructed on the principle of the flush-tank, their discharges filling the water-passages "full-bore," so as to keep them clean. The overflow and outlet passages should be combined in the form of a stand-pipe, thus doing away with the usual foul, inaccessible and badly jointed lead overflow-pipe, and the troublesome and dirty plug and chain. The stand-pipe should be operated by a simple mechanism above the slab, for convenience and cleanliness, requiring but a single movement of the hand, and all parts should be of solid and durable construction, while the stand-pipe should be easily detachable for cleansing. The Sanitas Lavatories are all constructed after this principle, and they are the first ever so constructed. The stand-pipes are made of either plated metal or of earthenware, like the fixture itself, and the whole device produces a very ornamental effect, especially when decorated in colors to correspond with the decoration of the earthenware bowl. Finally, the ideal water-closet should have the simplicity of the short-hopper, with the sanitary advantages and convenience of the improved modern closets. More than this, it should be practically noiseless, anti-siphonic, quick-acting, self-sealing, and free from spattering or waste of water. These desiderata have been attained in the Sanitas Water-Closet of which we sketch the outline in section. The supply-pipe between the cistern and the closet discharges into the latter below the level of its standing water, and being without air-pipe, stands permanently full of water, hence the action is instantaneous and the noise of flushing is deadened. This and the peculiar construction of the flushing-rim and water-supply passages cause the waste to be discharged with wonderful speed and effectiveness; and at the same time so quietly that with the cover down and the toilet-room door closed, no sound of flushing can be heard from without. The closet is highly ornamental in appearance, hence no other wood-work is required than the seat and cover, and these may be supported directly on the earthenware itself, which is constructed with this in view. The Sanitas System, taken together, is the most economical as well as the only safe system of plumbing, as avoiding the dangers and complication of special trap venting. Whether vented or not it is now admitted that safety requires a trap to be *anti-siphonic*, the vent-pipe alone not being reliable. The Sanitas Trap holds sufficient water to resist, when properly set, any *back pressure* that can occur in good plumbing with properly vented soil-pipes. For more detailed description and illustration of the Sanitas Appliances, see our other Advertisements and the Circulars of

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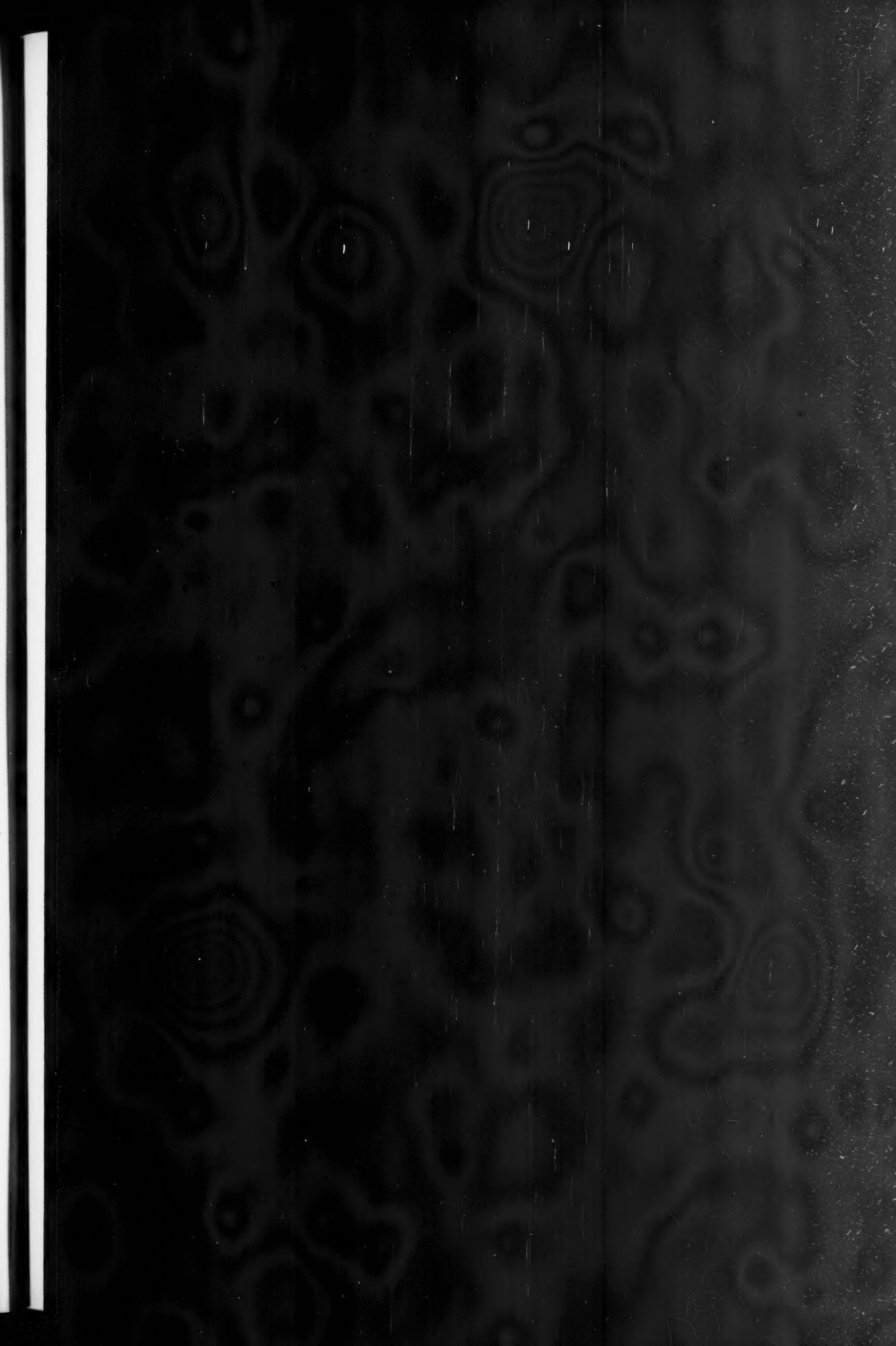

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THE *Sanitary News* gives a report of a discussion which took place at a recent meeting of the Illinois State Association of Architects on the subject of the union of all the existing professional societies. While several speakers maintained the importance of such a union, Mr. Normand S. Patton, in a very clever paper, presented the opposite view, holding that an association of architects must be mainly for social purposes; that there were no questions of general interest for a national body to consider, and that even matters of professional ethics, which might have a certain general importance, were far better regulated in small societies by the influence of mutual acquaintance and regard than by the decrees of a far-off tribunal, which could not be carried into effect without great trouble. In his opinion, the local influence of a society could not be made to extend more than about five hundred miles from the seat of its principal activity, and the establishment of three main associations, each controlling a territory a thousand miles wide, would be more favorable to the interest of architects and architecture than the maintenance of one gigantic, but imperfectly nourished organization. In the discussion which followed, Mr. Patton explained that he favored the establishment of a national organization, if this could be carried on without giving up existing societies; and most of the speakers seemed to agree with this view, many of them, however, suggesting various matters which could be better left to a national body than to the local ones, among these being the establishment of rules for professional conduct, for the management of competitions, and so on, as well as the protection of members in disputes involving questions of general interest to the profession.

THIS last suggestion, which was made by Mr. L. H. Sullivan, seems to us to contain the germ of great possibilities for the proposed national society. Probably most architects think that some sort of federal organization is desirable for a national body. There are isolated cases where architects may with advantage be elected directly by the central association, but experience has shown the great advantage of having most of the members enter the association from the local societies, which know all about the character of their own members, and, as a rule, keep a salutary control over their professional conduct. The principal difficulty about such an organization has been hitherto, as it seems to us, the absence of any great advantage of membership in the general body over that which those enjoyed who simply belonged to the local organization. If the members of a national body, chosen or nominated by the local societies, or, perhaps, holding a place in the national society by the fact of connection with a local body, were alone eligible to some important and profitable position, or enjoyed exclusively some other valuable privileges, there would be no difficulty in filling the ranks of the central as well as the local bodies. Perhaps later, in connection with Government commissions, some such recognition may be given here, as in France, to the members of a body representing the best and most honorable professional work, to the great advantage of the public and of art, but at present the most tangible advantage which a national organization can offer to architects as individuals is, perhaps, the promise of support in their struggles for justice with the people who try to impose upon them. We are persuaded that if architects, after their first ten years of practice, would look back and count up the "discounts for cash" which they have had to make from their bills, the compromises, bad debts and open frauds, the hours spent in making plans abandoned and never paid for, the barefaced swindles perpetrated upon them in the guise of competitions, and the losing bargains into which they have been entrapped on various pretexts, they would be amazed at the result. Judging from our experience, there are few architects who have been ten years in practice, who are not ten thousand dollars poorer than if they had experienced such treatment during that time as the profession considers itself fairly entitled to, and a very large part of this sum would represent the money value of connection with an alert and powerful organization, quick to take up the defence of its members against wrong, and armed with the authority of a great representative body, as well as experience and skill in managing such cases. As a rule, no action on the part of the central body would really be needed. The consciousness of support would give the younger members courage to persist in rightful demands, and refuse compromises or concessions, and if this failed, an admonition from the central body would generally bring the adversary to terms, so that actual cases carried on by the association on behalf of members would be much rarer than they are now between individual architects and other persons, and the cost of protection need not be very large. It would be desirable, on all accounts, to confine the employment of such defence to members of the national body, for the reason that, if properly chosen, their good faith could be depended upon, and, if judiciously managed, the support so afforded would be so valuable as to draw all the better part of the profession into the local societies, and through these, into the necessary relation with the national body.

THE *Sanitary News* quotes some very singular observations from Mr. J. S. Haldane, who has made many analyses of air in England, the results of which are in startling contrast with the common notions on the subject. Some of Mr. Haldane's most important tests were made on air taken from sewers, and this air was found, so far as analysis could discover, to be actually purer than the atmosphere outside. The sewers of the city of Bristol, for instance, are almost wholly unventilated. There are only two places of access to the system, and the air, when Mr. Haldane visited them to make his analysis, was much warmer than that outside, from the effect of the prolonged action of the warm sewage in a confined space. Yet the air of this sewer, taken as far as practicable from the opening, showed only about twenty volumes of carbonic acid in ten thousand, a smaller proportion than in average schoolrooms, while in "bacteria" and organic germs, which have now rather superseded carbonic acid as atmospheric bugbears, the sewer air was far purer than that of the streets outside, the average in the unmixed sewer air being two to the litre, while air taken outside at the same time averaged thirteen per litre. The same results were obtained in other cases, so that, as Mr. Haldane says, instead of sewer air being "loaded" with microbes, as is commonly believed, it is the outside air, which, when it is allowed to get in, contaminates the sewer atmosphere, the latter being, chemically speaking, exceptionally pure. It is, of course, not impossible that the sewer-microbes may be more venomous than the ordinary sort, but there is no positive evidence of this, and the indications are that they are nothing more or less than those of the exterior air, which have been drawn in somewhere, and not yet eliminated by the natural process of coming in contact, in their flight, with the moist walls of the sewer, or the surface of the stream, and sticking there. So unanswerable do these conclusions appear to the editor of the *Sanitary News* that he can see no way of accounting for the entrance of bacteria from sewage into houses through leaky pipes except by supposing that where this occurs, if it ever does occur, some liquid sewage must have splashed through the openings, and have dried on the outside, coming thus into

a suitable condition for being taken up as dust and disseminated through the air of the room. As sewer-pipes almost always corrode first on the upper side, where liquids seldom or never come in contact with them, it would be rather a violent assumption to suppose that the bad effect of a leak could only be due to the passage of liquids through it, and even this would fail entirely in accounting for the transmission of typhoid-fever infection, as is said to have happened at Croydon, through the sewers from the lower portions of the town to the higher parts. The fact is that, as the *Sanitary News* well observes, our knowledge of the subject of infections is very limited. Not long ago, many physicians doubted the existence of such a thing as infection, and attributed epidemics to "atmospheric influences," "periodical tendencies," and so on. A little later, perhaps more particularly after Pasteur's famous researches, specific infections were reëstablished as real objects of scientific study, and, as hardly a week passed without the announcement of the discovery of a new microbe, the world began to multiply, instead of diminishing, the number of infectious diseases, and to see noxious germs everywhere, in the air, the water and the earth. What will be the next step it is impossible to say. No student of sanitation can have failed for some time past to observe the existence of the beginning of discontent among sensible people, with the theories which accused bacteria of being the cause of all our woes. As many of the so-called specific microbes of disease are indistinguishable from others which swarm in healthy persons, and as myriads of all sorts float constantly in the air, it is not strange that people should ask themselves how it is possible to escape contagion conveyed in that way, and there will be a certain relief in finding that the source of infection is still one of the unsolved mysteries of life.

A PAPER was read at the recent meeting of the British Association for the Advancement of Science, by Mr. W. Brindley, who is, we suppose, connected with the great firm of Farmer & Brindley, workers in marble and ornamental stones, upon the rediscovery of the ancient porphyry quarries of Egypt. It is well known that the Egyptian porphyry, a very hard stone of a purple red color, generally speckled with white crystals of felspar, was valued by the Romans more highly than any other building stone, and was used by them not only for shafts of columns, but for statuary, vases and other small objects. The ancient writers agree in saying that the quarries from which porphyry was derived were situated in Egypt, but, although two or three travellers had searched for them, no one had given satisfactory proof of his success in finding them, and, as Mr. Brindley learned, the samples of stone brought by various explorers from the quarries they had visited were of different character from the real antique porphyry. In February of this year Mr. Brindley, with his wife, started on an expedition in search of the precious deposit. Of course, this would be found, if anywhere, in the mountains of granite and other primitive rock which lie between Thebes and the Red Sea, and to this place the party proceeded. After a visit to the famous granite quarries at Syene, Mr. Brindley returned to Kiné, a village on the Nile below Thebes, from which a practicable, but little-known path crosses the mountains to the Red Sea, and there formed his caravan for the trip, consisting of fifteen camels, attended by nineteen servants, and loaded with provisions, water and other necessaries for a three-weeks' journey. On the second day the camp was pitched at an ancient Roman station, showing remains of fortification; and some bits of real porphyry were found in the sand. The next day a similar station was reached; and on the third day another, near which were passed several porphyry blocks, and a portion of a column, all buried in the sand. The path now entered a rocky pass, through mountains five or six thousand feet high, each day's journey being marked by the ruins of a fortified Roman station, with either a well or the remains of cisterns, this having been, just before the Christian era, a portion of the main caravan route connecting the Roman system of roads in the Nile valley, and by it all Western Europe, with the Red Sea and India, but no more porphyry was found, and Mr. Brindley began to fear that he had missed the object of his search. On reaching the summit of the pass, therefore, he paused, to take a more extensive view, and saw, looking eastward, that the path descending from the pass toward the Red Sea divided, about half-way down, one branch going toward the ruins of a considerable town, which were visible in the plain, while the other branch diverged across the valley toward a mountain which, when examined through a field-glass, showed the purplish hue of porphyry. Starting immediately down the path in that direction, he soon came to the foot of the purple mountain, where, to his great satisfaction, he found the sand strewn with bits of porphyry, while near by stood the piers to support the slide by which the blocks were sent down from the quarry above. The path to the quarry itself had once been excellent, but was now interrupted in places by gullies, so that there was some difficulty in reaching the place where the ruins of a number of workmen's huts, together with a steep face of rock, in admirable condition for cutting, indicated that here the main quarry was situated. Instead of porphyry, however, the rock appeared to be a dull, yellowish stone, of no value, and Mr. Brindley concluded that this must have been merely the matrix of the fine veins of porphyry. While looking for these veins, however, he observed that the vertical face of the yellow rock was full of drill-holes, and, wishing to learn for what purpose it could have been used, he knocked off a piece with a hammer. To his surprise, the broken surface showed the color of the finest porphyry, and after breaking off more specimens, he found that the whole ledge was of the same sort, superficially covered with a film of ochre which had washed out of the rocks above. After satisfying himself that this was unquestionably the long-lost Roman quarry, he retraced his steps, passing on the way a ruined temple, with an inscription invoking the favor of Serapis upon the Emperor Hadrian, and commemorating the loyalty of a certain Epaphroditus Sigerianus, the superintendent of the quarries; and, returning to Cairo, secured from the Egyptian Government a concession for reopening the quarries, which are likely now to be scientifically worked.

THE new process for covering iron and steel with an unchangeable coating, by means of electricity, discovered by M. de Méritens, and mentioned last year, is now fully described in *Le Génie Civil.* Nearly all the processes for protecting iron so far used have consisted in the production on the surface of a film of magnetic oxide, which is permanent and unchangeable. The old methods of browning or bronzing gun-barrels accomplished this result very imperfectly by corroding the outside of the barrel with acid fumes or washes, so as to cover it with the ordinary red iron-rust, or sesquioxide. The gun was then rubbed with iron turnings, or a wire brush, by which particles of metal, in fine division, were scattered among those of the sesquioxide, and a partial combination effected, by which the higher oxide was reduced to the condition of magnetic oxide. To obtain a durable film, the operations of corroding and rubbing down were often repeated twenty or thirty times, and even then the protection was far from complete. Some years ago Messrs. Bower and Barff discovered independently two different methods of coating iron directly with magnetic oxide, one using for the purpose a bath of hot-air, while the other employed superheated steam. Each patented his process, and the two interests were afterwards united, and companies formed to carry on the business of covering objects of iron with the protecting film, by the medium of either air or steam, as might be most convenient, under the general name of the Bower-Barff process. Under the skilful manipulation of M. de Méritens the ordinary electro-plating bath is now made to deposit on iron a film of magnetite which is said to be even more uniform and adherent than that formed by the older processes, while the apparatus required is far less costly. To form the coating, the object to be protected is placed in a bath of distilled or other pure water, and is connected with the battery or dynamo as anode. The cathode may be a piece of copper, iron, or carbon; or, if the vessel containing the bath is of iron, it may itself be the cathode. The bath should be heated to about one hundred and eighty degrees Fahrenheit, and the currents must be weak, having just electromotive force enough to decompose water, after overcoming the resistance of the circuit and the bath. A few minutes after placing them in the bath, the objects to be protected, which should first be polished, begin to become black, from the formation of magnetite upon them; and in an hour or two the film is thick enough for service, and may be polished. The magnetite not only adheres with great tenacity, but seems to penetrate deeply into the pores of the metal; for after rubbing off with emery every vestige of a coating once formed, the object is almost instantly covered again, on replacing it in the bath.

TECHNICAL SCHOOL BUILDING.

From Brussels, Belgium.

THIS is an age of specialists; and in no department of human industry and thought has this condition been made so manifest as in architecture, a profession at all times complex and many-sided in its nature, but made even more so by the constantly-multiplying demands of modern life, and by the tendency of individuals in the profession to devote their energies exclusively to the mastery and the education of a single department. That architecture on the whole is the gainer thereby there can be no reasonable doubt. The time was once, and not long since, when the architect was the autocrat and was assumed to be past-master of every detail of design and execution. Now, the business necessities of the profession, no less than the artistic limitations which govern it, have given rise to the feeling that art is too long and time too fleeting for the individual to grasp everything; and whenever the general practitioner has the opportunity to avail himself of such excellent experience and research as is embodied in the recent work on School Buildings, by E. C. Robins,[1] he can not but feel how vastly the profession has been advanced by the continued, persistent efforts of men who claim to be at home in a single department of architecture, but who understand that department thoroughly.

Mr. Robins's work is, however, more than a mere treatise upon architecture as applied to school building. It is a book which will be invaluable to the educator, no less than to the architect. The first two chapters are devoted to the consideration of technical education in England and on the Continent, including a careful analysis of the reports of the Royal Commissioners on Technical Education, and discussing all the points involved in the organization of such schools as the Central Institution at South Kensington and the Conservatoire des Arts et Métiers at Paris. There are also two chapters on heating and ventilation, and a chapter on sanitary science in its relation to civil architecture, though neither subject is handled in a way to make the chapters of special value to the American student. It may be only an exaggerated national pride, but somehow it has always seemed to us that in view of our own advance in such matters during recent years, and considering the great climatic differences between this country and Europe, we can, after all, obtain from the trans-Atlantic authorities only general hints and suggestions in the departments of domestic and sanitary engineering. But, for that matter, the chief merit of Mr. Robins's book fortunately does not lie in the discussion of theories and systems, but rather in its presentation of facts, and right there the author's practical experience as an architect serves him in good stead, for he has been enabled to collect just the data, statistics and drawings which an architect would naturally turn to if called upon to solve any of the knotty problems involved in the planning of a chemical laboratory or the arrangement of an industrial school. In this respect the book is simply invaluable, as the greater portion of it is devoted to very complete descriptions of the plans, the arrangements and the internal fittings of the best science and art schools in England and on the Continent. The result is a mass of very well-digested facts arranged with a care and thoroughness which we might expect from some German professor or a French *savant*, but which would hardly be looked for from a busy man engaged in active architectural practice. Another advantage which the book offers is that nearly all of the data was collected personally by the author, and is, consequently, fresh, and in the main original. To use Mr. Robins's own words, "the author has striven to present to the scientific world the result of much study and travel, which he trusts may issue in the saving of much time and labor, and wasted energy, resulting from repeatedly going over the same ground; and also, by comparative analysis of the best examples, aid in the development of that discriminating power, without which the weaknesses of a design are as likely to be imitated as its strong points."

[1] *"Technical School and College Building"*: being a treatise on the design and construction of applied science and art buildings, and their suitable fittings and sanitation, with a chapter on technical education; by Edward Cookworthy Robins, F.S.A., F.R.I.B.A., etc. New York: D. Van Nostrand. London: Whittaker & Co.

The book is so wide in its scope that only a few of the buildings it deals with can be noticed here.

The new chemical laboratories of the Academy of Sciences, Munich, is considered by Mr. Robins as one of the best examples of modern German work. The conditions under which the building was planned are of interest as being essentially such as ought to govern the arrangement of every well-regulated laboratory of this size. The conditions were (1) That the laboratory must accommodate from one hundred and fifty to two hundred workers. (2) It must be divided into two spacious parts, one for inorganic, and the other for organic chemistry, each to be under separate direction. (3) The director of each portion must have a private laboratory with the necessary extra rooms, the assistants to work in the large laboratories. (4) The main laboratories must be sufficiently spacious, so that smaller rooms for advanced students need not be provided, in order to promote the intercourse of the workers; corridors, as far as possible, to be avoided. (5) Living-rooms in connection with the building must be provided for the assistants and servants.

The building, as finally decided upon, is quite neatly arranged. There is desk-room for one hundred and sixty-eight students in the laboratories. The ground floor is for the organic, and the first floor — or what we would term the second floor — for the inorganic divisions. The central point of the separate large laboratories, of which there are two on each floor, is occupied by the big chimney, which is placed in the internal angle between the north and west wings, which are at right angles with each other. At the ends of both wings, on both floors, are the two large laboratories; and from the connecting corridors between them access is given to the subsidiary rooms. A hoist near the chimney communicates with the store-rooms. At the end of one wing are the living-rooms, etc., and at the end of the other wing are the two private laboratories, projecting in an L beyond the main wing, and connecting with the large lecture or class room. The entire arrangement will be readily understood by reference to the accompanying sketch-plan. The only criticism that Mr. Robins has to make is that the private laboratories and professors' rooms should have been more centrally placed, and more directly in contact with the main rooms, though this was rendered impossible on account of limitations in the site.

A plan presenting a much better general arrangement, though more faulty in detail, is that of the Berlin Physiological Institute, a plan which is quite architectural in its appearance, with well-defined axes, symmetrically-disposed wings and pavilions, a grand central entrance leading directly to a main lecture-hall, and a wide longitudinal corridor. The problem is much more complex here than in the first example noted, and it speaks well for the architect that so many requirements for laboratories, professors' rooms, vivisection quarters, large and small amphitheatres, libraries, etc., should be so well combined into a scheme which should be at once perfectly adapted to its purpose, and at the same time be treated in so purely architectural a manner. Mr. Robins speaks of it as a good example of the manner in which these buildings are constructed in Germany, with the aid of government grants, by architects appointed by government, and usually themselves professors of architecture in one or another of the technical colleges.

The new chemical laboratory of the Zurich Polytechnic School, opened in 1886, is considered the largest and most perfect institute for teaching pure and applied chemistry as yet erected. The plan consists essentially of a large central entrance and stairway flanked by long lines of small laboratories, class-rooms, professors'-studies, etc., with the four large laboratories projected from the main portion of the building at each end, forming a complete letter H in plan. This arrangement does not seem as satisfactory on paper as the Berlin School, and we would hardly agree with Mr. Robins as to its superlative excellence. One of the best features of the plan is the complete isolation of the laboratories and the manner in which each is enabled to have abundant cross-light and ventilation, though such a scheme necessarily involves a spreading out and an abundance of corridors which is not altogether desirable. Mr. Robins calls special attention to the details and fitting, on which a great deal of care and study was expended by the professors in charge of the department. Each beginner's place at the working benches, in the large rooms as well as in the smaller laboratories, is provided with two gas-taps, one water-tap, and one vacuum-tap. Over and above this each double bench has, at either side, a water-basin, with a special water-tap and waste-pipe. The benches are provided with a number of closets and drawers of different kinds, and a special flat, with a lead-lined receptacle below for solid refuse. In every window niche there is a draught place, with a slate bench, gas, water, vacuum and waste pipes. These evaporating niches are over three feet wide, and therefore large enough to take good-sized apparatus; they can be divided into two compartments by means of a central sliding window. The draught is produced, first, by double chimneys passing through every one of the window piers; secondly, by pressure in the room; thirdly, in case of need, by a special gas-jet lighted in the exit hole. There are two end holes on each side of the niche, one close to the top, and another near the bottom of the niche, the second hole being intended for introducing any pipes conveying noxious gases. The arrangements are altogether worked out so completely that no special "stink room" is required, since all rooms are adapted for carrying on all sorts of work without nuisance.

Turning from the Continental examples, Mr. Robins next considers in detail a number of the more recently constructed English

schools of similar character. He makes no invidious comparison, but if the buildings he cites are to be considered as types of the best the country has done in such lines, the English architects have never studied the problem in the exhaustive, comprehensive manner which marks the work of their German fellows. Three schools by Mr. Waterhouse are illustrated, which are in every respect satisfactory and hold their own in comparison with the Continental work. That the other buildings show less comparative success, may, however, be due less to the architects than to the condition of technical education itself in England, which has never been developed to the point it has reached in Germany; for although the English have sent their best men repeatedly to Germany to study the ways and means, and although volumes such as the one at present under consideration have been published by the dozen, the German higher schools still maintain their superiority, unwilling though English critics and educators may be to admit the fact. It goes without saying, however, that the English schools are, nevertheless, worthy of most careful study and comparison.

One of the neatest arrangements given is the plan of the new Physiological Laboratory at Oxford, worked out in detail by Dr. Burdon Sanderson, which Mr. Robins considers "not only the latest in point of time, but also in point of merit, since it is the outcome of the ripened experience of a remarkable man." This laboratory is intended partly for practical instruction and partly for experimental investigation. As the subject comprises three branches of study: 1. That of the mechanism of the animal body; 2. That of the chemical processes which are carried on in it; and 3. Physiological anatomy and biology, it is necessary to provide for each of these subjects. In the Oxford laboratory the rooms devoted to these divisions of the science are entirely distinct, and in each subject the two purposes of research and instruction are separately provided for. The sketch-plan illustrates the details of arrangement better than any description. It is compact, easy of access to all parts, and abundantly supplied with cross-light and ventilation, all very essential requisites of a building of such a description. It is of interest to note how really similar this plan is to that of the Munich Laboratory, the first example considered. The arrangement is practically the same in each case, so far as the main departments are concerned. In the Oxford building the rooms are more closely connected and work together better, but in the Munich laboratory the dark inner corner is avoided more skilfully, and the large rooms are more thoroughly cross-lighted and ventilated, so that there is really very little to choose between the two.

A plan which is worthy of more note than Mr. Robins gives to it, is that of the ground floor of the University College, Dundee. It is an entirely different arrangement from anything else presented in the volume, the main building forming three sides of a rectangle enclosing the two laboratories, the room for quantitative work being lighted apparently only from above. Where all the ventilation is forced, the fact that the inner laboratory has no outside air or light except from above, would present not the slightest difficulty in execution, whereas the compactness and immediate accessibility of all the rooms would render the plan a peculiarly good one for a crowded site and under certain conditions.

It will be noticed that nearly, if not quite all the examples illustrated by Mr. Robins, are physical or chemical laboratories. He has, however, descriptions of nearly all the purely technical or trades schools in Germany and England, but he appears to have rightly assumed that the problems involved in a laboratory were essentially the same in general statement as those in any industrial school, while at the same time they presented a complexity of detail which called for special study and explanation.

Mr. Robins cannot be too highly praised for the care he has bestowed upon the details of his work. His descriptions leave nothing to be desired, and without becoming in any degree prolix, he tells everything there is to be told which can be of interest to the architect or the professional reader. Details of fittings, floors, exhaust systems, water and gas supplies, sulphuretted-hydrogen closets, balance-rooms, machine-shops, besides the more general questions of systematic arrangement, are all clearly noted in every building brought under consideration. If one were disposed to be captious it might be said with reason that he has confined his attention too exclusively to English and German work, ignoring the best French work, apparently assuming that the Conservatoire des Arts et Métiers was the last word on the subject from France. But we can hardly find fault with so thorough and conscientious a writer, especially when he does this country and our pet institution the honor implied in the final statement that the best technical school in the world is the Massachusetts Institute of Technology.

The Cost of Portland Cement. — The Hamburg *Börsen Zeitung*, in discussing the question frequently raised of late, whether the present movement in Portland cement is transient or whether the prospect for the ensuing year is favorable, says: "Significant indications are given by the result of the public competition which took place in Posen on the 2d of this month for the large quantity of 85,000 normal tons. This cement was ordered for use on the royal fortifications, and is deliverable in the period from now to June, 1889. The tenders submitted by ten manufacturers are, on the average, after allowing for transport charges, thirteen per cent higher than those of June 2, obtained by the same department for 18,000 normal tons. Especially significant is the fact that the lowest tenders of November 2 are about twenty three per cent above the lowest of June 2.—*London Times.*

AN INTERESTING HISTORICAL RELIC IN THE CITY OF MEXICO.

THE CHURCH OF SANTO DOMINGO.

It is not difficult to find historic buildings in the city of Mexico. Once become acquainted with the history of the country, and most of the buildings of its capital will be found to bear some relation to it. The Church of Santo Domingo, the ruined walls near it, the medical college across the street on one side, and even a part of the row of new buildings across the street on the other side, form a group of buildings of peculiar historic interest. Each building was more or less nearly connected with the acts which went to make up one of the darkest chapters of Mexican history. Within that group of buildings the Inquisition had its home, and from one of them went forth stern decrees, delivering certain unfortunate beings over to the "secular arm" for punishment, which was only an indirect method of condemning them to death, by strangulation generally, and in some rare cases by burning.

It is not strange that many hasty visitors should be misdirected in their efforts to see the sights of the Mexican capital. Several things conspire to bring about such a result. Unless a change has been made very recently, the city is not supplied with reliable guides for the benefit of tourists. Many there are who claim to be guides, and these "*mean* well, but they don't *know*." Then the Mexicans cultivate politeness at the expense of accuracy. When you ask a Mexican a question you invariably receive a very polite reply, since to his mind to disclaim knowledge of a subject would not be polite. He has no idea that you especially desire accurate information. He has never experienced such a desire himself, and is unable to conceive of it in others. He imagines that you ask questions merely for the sake of sociability, and he answers accordingly. It is scarcely necessary to hint that errors are likely to occur, furthermore, in the exchange of ideas between an American with only a slight knowledge of Spanish and a Mexican with a knowledge of English still more slight. Indeed, all things considered, it is a marvel that American tourists obtain *any* correct information in the City of Mexico, and the errors perpetuated in print concerning the Sister Republic are quite pardonable.

The Church of Santo Domingo was pointed out to me soon after my first arrival in the City of Mexico, as doubtless it has been pointed out to many others as the building in which the Inquisition held its secret trials. Subsequent visits to the locality, and a careful study of everything relating to the Inquisition in Mexico, revealed the fact that the Holy Office never occupied the *Church* of Santo Domingo, but upon its establishment in the country, in 1571, a small monastery, which had been temporarily occupied by the Dominicans, was placed at its disposal. This was rebuilt shortly afterwards, and upon the same site was built, in 1732 or thereabouts, the building now known as the Escuela de Medicina (Medical School). It was dedicated to its present use about the middle of this century. It is across the street, at the right of the church, as that building is approached from the front. It retains but few of the architectural features which it possessed when devoted to the business of extirpating heresy and punishing ecclesiastical crimes, excepting its massive corridors and dark passageways.

The church is by far the more attractive building. The eucalyptus trees in the plaza before it, hide the front from view until the visitor arrives within a few feet of the entrance. The façade is elaborately carved in the Churrigueresque style. The church is of stone, whitish in appearance in front, a dark red on the street side. Of course whitewash, plaster, and paint have been used upon it. Richly-carved stone walls have in more than one instance received this treatment in Mexico; and there may have been cause for the application of something of the kind in the case of Santo Domingo. Bullets may have flattened themselves against the front, and fires may have burned around it to blacken its walls; for there have been revolutions and insurrections in Mexico since this church was built in 1736 to take the place of buildings erected in 1575, and destroyed by floods in 1716; and the plaza in front of the church has been a favorite place for political executions. The church has a fine dome and lantern, and a single tower at one corner, the corresponding tower on the opposite corner never having been completed.

The interior of the church compares favorably with any in the city. It is finely proportioned, decorated in rather good taste, and possesses paintings of some merit by native artists.

Back of the church, and on the left side, are the ruined walls of the Dominican Monastery, which must have been an immense building and a comfortable home for the order of Saint Dominic (Santo Domingo.) It shared the fate of all monastic property in the Republic, which in 1859 and 1860 was confiscated by the government, gutted, secularized, and left in partial or total ruin. Land for a street was "condemned" along the west side of the church about that time, and further destruction went on; but, fortunately, a very pretty little chapel — that of the Rosario — was left standing. The new street was in a very rough condition until a few years ago, when some enterprising capitalist, overcoming the scruples so general in Mexico against occupying property robbed from the church by the infamous "Reform Laws," proceeded to erect dwelling-houses on both sides of it. Very shallow were the lots on the side towards the church. A narrow shop hugs the front of the church as if claiming its protection. Red bricks were used in the construction of this row of buildings, — a strange building material in Mexico. The effect of the new street would be marred by these brick buildings, were it not that through open doorways, glimpses are caught of quaint interiors and picturesque stairs. There is no knowing to what use the ingenious architects (for the modern Mexican architects *are* ingenious and eminently successful in blending the old with the new) have turned the buttresses and other exterior ornaments of Santo Domingo in the interior arrangements of these new buildings. The skill displayed on the opposite side of the new street leads to the suspicion that everything has been turned to good account.

The opening of the new street laid bare the highly ornamented façade of one of the *patios* (court-yards) of the monastery. This the architects left standing, and it forms the front of one of the row of stone residences they were commissioned to erect on west side of the new street. The new and the old, the plain and the ornate, are most picturesquely blended. The handsome façade, with its exquisite carving, arches, pilasters, and balconies, all the work of an architect of the early part of the eighteenth century, stands in the midst of plain but substantial-looking buildings of the latter part of the nineteenth century, yet the effect is pleasing. It looks as if it were entirely spontaneous.

Another architectural feature of the vicinity of Santo Domingo claims our notice, — the *portal* along the west side of the *plaza*. The second story of the building extends over the sidewalk and rests upon stout columns on its outer edge. Between these columns are displayed heaps upon heaps of junk, — or *bric-a-brac*, — which name is preferable depends upon the point of view. One who knows Mexico pretty well, and has acquired the knack of dealing with the merchants who occupy the *portales* can often pick up in these places, "for a mere song," many rare and curious things.

ARTHUR HOWARD NOLL.

PARIS CHURCHES.[1] — VI.

ST. ETIENNE DU MONT.

TOMB OF THE FOSCHERARI, BOLOGNA.

UPON the summit of the "mountain" which rises up from the Seine opposite and on the south side of Notre Dame is the church of St. Etienne du Mont. Some few years ago the "mountain" was an interesting part of Paris to the archæological explorer and the collector of *bric-à-brac;* but it has been so cut through by new streets and boulevards that it has almost been improved out of existence. At the foot of it, in a little street turning off from the Quai de la Tourelle is all that remains of the famous college of the Bernardins, now used by the *sapeurs-pompiers*, or firemen. This celebrated college was founded by an Englishman, Stephen of Lexington, Abbot of Clairvaux, in 1244, upon some ground belonging to the rich abbey of St. Victor, Alphonse, the brother of St. Louis, being the titular founder and protector of the establishment. The great church, begun in 1338, to replace that of Stephen, by Pope Benedict XII and Cardinal Curti, was never finished, but was considered, in the fourteenth century, to be of great beauty. (Pope Benedict was, as Jacques Fournier, professor of theology in the college.) But more fortunate than the church, the refectory remained intact in all its beauty until our own time, though unfortunately in 1845 it was sadly mutilated in order to adapt it to use as a barrack. A portion of the cloister may still be seen in the street, a pointed arch built into the modern wall of a house with square windows in between. It is time the municipality of Paris, or the society for the preservation of ancient buildings bestirred itself to restore the few fragments of old Paris which yet remain. The Revolution did much damage; but it rather put the conventual buildings to secular uses than destroyed them altogether. It remained for later governments, and those, too, professing respect for religion, to utterly demolish the mutilated convents and churches in order to make straight streets and boulevards.

The convent of Ste. Geneviève was founded by Clovis, and so extensive were its lands and dependences that ere long it drew to it a large population of workmen and laborers. A priest was appointed to look after the spiritual wants of these, and from this commencement grew the parish of St. Etienne. Originally the congregation met and worshipped in the crypt of the abbey church, and their chapel was put under the protection of St. John the Evangelist, it being thence called St. Jean du Mont. But in the thirteenth century the congregation had outgrown its chapel, and in 1224 the Bishop of Paris authorized the building of a church by the side of the abbey, to be consecrated to the memory of St. Etienne, the protomartyr. This first church, in fact, formed a part of the abbey, as it had no separate entrance of its own — one could only enter it by the doorway of Ste. Geneviève. Three centuries later the same reasons (want of space), obliged the church to be rebuilt, and in 1517 it was commenced. Abbot Philippe Lebel finished the choir in 1537, and in 1541 the Bishop of Mégare consecrated the altars in the name of the Bishop of Paris. The *jubé* was commenced in 1600, the porches in 1609, and the chapel of the Blessed Virgin in 1661: the first stone of the great doorway was laid in 1610 by Marguerite de Valois, the first wife of Henri IV, and she added to the value of her work by contributing 3,000 livres to the building fund. Before the Revolution the *curé*, or rector, was one of the "regular" canons of Ste. Geneviève, who was assisted by twenty-four priests. In 1791, when the parishes of Paris were re-organized, it was determined to remove the relics of Ste. Geneviève to St. Etienne, and to rename the church after the maid of Nanterre; but the decree was never carried out — reforms and resolutions followed each other so rapidly that there was no time to put them into execution.

St. Etienne is a cruciform church (somewhat leaning to the right, as is so common in old churches), with a nave, two aisles and chapels. The transepts scarcely project beyond the nave. The exterior is a mass of elegant ornamentation, and on the north side, under the windows, is a passage which connects the porch of the second bay with the *charnier* — a sort of cloister built round the apse, exterior to the church. There is something extremely coquettish and fascinating about this church, with its high-pitched roof, springing from a Renaissance façade; and its fifteenth-century tower surmounted by a pepper-box lantern.

The old church of the abbey, which completely joined St. Etienne, has been swept away to make room for the Rue Clovis, but the refectory and the tower still form a part of the Lycée Henri IV.

The interior of St. Etienne is no less singular than the exterior. The side aisles are nearly as high as the nave and have enormous windows, which light the nave. The shafts which support the vault of the nave are of great height, and the bays are of the same elevation as the side aisles. Thus, where in most churches there is a triforium over the vault of the aisles, it is here open to the nave. Above these bays is a clerestory, the windows of which are as broad as they are high, with depressed pointed arches. In order to diminish the enormous height of the bays, the architect has conceived a device which I do not remember to have seen elsewhere. Half-way up, he has carried a sort of gallery of about a couple of feet wide, which goes the whole length of the church, encircling the massive columns, but broken at the transept. On the side of the nave, this gallery has an open, pilaster balustrade, and at the entrance of the choir it joins the *jubé*. On each side of this is a spiral staircase leading up first to the *jubé*, and then, a second flight to the choir-gallery. The former is formed of a single flying-arch, supported by two pilasters. The whole screen is ornamented with rich carving, an angel with palm-leaves is in each spandrel, and above all is a huge crucifix, completing this beautiful and original specimen of French Renaissance. The pendant bosses of the nave and crossing are exceedingly rich in ornament — garlands of flowers, angels' heads, the symbols of the Evangelists, rosettes and armorial bearings. The pulpit was designed by La Hire, the painter, and sculptured by Claude Lestocard. It is a mass of rich carving. A huge Samson supports the lower part, while upon the canopy are little angels of the winged-cupid tribe, and at the summit, a draped angel with a trumpet. The organ is also a fine example of seventeenth-century woodwork. But it is the glass of St. Etienne which is perhaps its chief glory. Although a great deal has been destroyed and patched up, much remains which is quite worthy of study, being as it is, in the best style of the sixteenth and seventeenth centuries, and the work of Jean Cousin, Claude Henriet, d'Enguerrand Leprince, Pinaigrier, Michu, François Périez, Nicholas Desengives, Nicholas Lavasseur, and Jean Mounier. But, unhappily, mendings and patchings have quite destroyed our power of discovering to which artist the different windows are due. In the *charnier* there is one very curious composition, illustrating the allegory of the wine-press: our Lord lies upon a table in the presence of the Father and the Holy Spirit, bathed in a sea of blood which flows from His side and feet. Underneath, the blood pours down through an opening into a large cask. Prelates and kings carry off to a cellar barrels, which have been filled with the Sacred Blood by the doctors of the Church, while the faithful run to the porch to receive the Blessed Sacrament.

[1] Continued from No. 609, page 97.

It is a strange design, and reminds me of something similar which I once saw in a little village of Tyrol: up a Way of the Cross was a tiny chapel, containing a life-size figure of our Blessed Lord; this was placed at the back, and in front was a pool of water — I imagine miraculous. A cup fastened by a chain allowed the faithful to drink thereof. But the strange part of it was the pool, which was supplied by water flowing from the hands and side of our Lord — no doubt symbolic of His being the Living Water, the well from which whosoever drinketh obtaineth everlasting life. The idea is somewhat materialistic to the mundane dweller in cities, but to the simple-minded inhabitants of Tyrol, it is full of poetry.

When the abbey of Port-Royal was destroyed in 1710, the body of Racine was transferred to St. Etienne and placed in the crypt of the Lady Chapel by the side of Pascal, and in 1808, a Latin epitaph composed by Boileau, which was discovered in the pavement of the church of Magny-les-Hameaux, was also transferred. The painter Le Sueur was buried in St. Etienne, though no monument was erected.

But the main attraction of St. Etienne is the tomb of Ste. Geneviève. Long before the Panthéon ceased to be the church of Ste. Geneviève, it was to St. Etienne that the faithful went to pray for her intercession and to have their rosaries placed upon her coffin. Here, any day, but especially during the octave of her *fête*, you may see people bringing handkerchiefs, rosaries, crosses, towels, etc., to be placed in the shrine, in order to carry the saint's blessing and help to the sick and the suffering. The stone coffin is said to have been found in the crypt of the abbey church during its demolition in 1801, but whether it be the original one in which the saint was buried in 511 it is impossible to say, as it is so surrounded by ornamental ironwork that its workmanship cannot be studied, but the effect of the little chapel containing this *tombeau*, with its lights and flowers and stained-glass, is very charming, and during the *Neuvaine*, when the church is ablaze with candles and hundreds of people *font queue* to the shrine, it is a sight not to be forgotten.

S. Beale.

The Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

AN INTERIOR IN THE HOUSE OF C. L. TIFFANY, ESQ., NEW YORK, N. Y. MESSRS. MCKIM, MEAD & WHITE, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print, issued only with the Imperial Edition.]

As Mr. Louis C. Tiffany had a large part in designing the interior fittings of this house, it is quite possible that it is his work that is here shown, and not the work of the architects who designed the building. We are enabled to publish this print through the courtesy of the Soule Photograph Co., of Boston, who hold a copyright on the only views of these interiors that are obtainable.

WOBURN FIVE CENTS SAVINGS BANK BUILDING, WOBURN, MASS. MESSRS. J. R. & W. P. RICHARDS, ARCHITECTS, BOSTON, MASS.

This building is 55′ x 80′, having two stores on the first story, the Savings Bank to occupy one-half of the second story, the remainder being appropriated as offices; the third story is to be occupied by the Young Men's Christian Association, and the fourth story is to be occupied as a club-room; the basement rear rooms are one-half for business purposes, the other for boilers, and the front portion for cellars and stores. The finish is of hard woods throughout. The exterior walls on three sides are faced with hand-pressed bricks, with Longmeadow stone trimmings. It has a Whittier elevator and is to be heated by steam, with open fireplaces to principal rooms. Total cost, $45,000.

PLANS OF VARIOUS EUROPEAN TECHNICAL SCHOOLS.

For description, see article published elsewhere in this issue.

THE INTERIOR OF ST. ETIENNE DU MONT, PARIS, FRANCE.

For description, see article elsewhere in this issue.

DESIGN FOR A SEASIDE COTTAGE. MR. E. G. W. DIETRICH, ARCHITECT, NEW YORK, N. Y.

CHURCH OF SANTA MARIA DE L'ANTIGUA, VALLADOLID, SPAIN.

A Possible Way of Erecting Obelisks. — The latest explanation of the way in which the ancient Egyptians erected their enormous monoliths and obelisks is that inclosures were made around the huge stones as they lay horizontally on the ground, floats were attached to the upper ends of the stones, water was then introduced into the inclosures and the monoliths were floated up straight. — *N. Y. Commercial Advertiser.*

THE MEDIÆVAL GRILLE. — I.

(From the French of Viollet-le-Duc.)

From the Cathedral of Puy-en-Velay.

In early Mediæval times they cast their grilles in bronze after the manner of ancient Roman gratings, and in the Church of Nôtre Dame at Aix-la-Chapelle there are famous grilles, cast in copper, dating from the time of Charlemagne, and probably made either in the East or by Byzantine artists in Lombardy.

Such castings while very expensive both in material and workmanship were easily broken, and it was not long until iron, commonly used in Gaul from an early period, was the preferred material.

The art of the smith was brought to wonderful perfection during the eleventh and twelfth centuries. The modern methods were not known. Iron was flattened into plates or hammered into bars by hand. The smith of to-day gets his iron from the mills in bars of all lengths and sizes; while his prototype of the Middle Ages found one of his chief difficulties in fashioning by hand long bars of equal thickness, well squared and straightened. And while we cannot ignore the immense advantages of mechanical workmanship, it is a certain and regretable result of improved appliances that the smith has, little by little, lost the knack of handling iron and the knowledge of the qualities of the metal.

The Mediæval smith, working his red-hot iron, turning it over and over upon the anvil, and bringing it gradually to a square, was naturally limited as to the size and length of the bar, and sought combinations by which to avoid long and heavy pieces. The most ancient grilles, therefore, are made up, so far as possible, of small pieces of ironwork. One of the oldest known grilles (Fig. 1) is at Puy-en-Vélay, in the Cathedral. This grille opens on a hinge and has an iron frame, 0.04m. by 0.02m., containing four cross-pieces separated by uprights of 0.015m. by 0.02m. set on edge, between which are placed very artistically wrought scrolls of iron. In the height of the grille there are five panels of scrolls welded at top and bottom, and held to the uprights by clamps not welded but simply put on hot. This grille probably dates from the beginning of the twelfth century. The smith seems to have conceived the idea of hiding the usual irregularities of hand-worked iron by covering the uprights, frames, (Figs. 2 and 3) scrolls and clamps with the dents and incisions which give such a rich effect to this piece. The traceries were executed upon the cold iron.

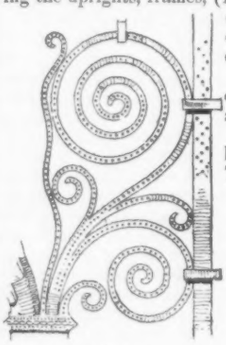

Fig. 2.

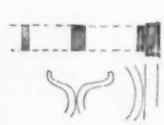

Fig. 3.

Fig. 4

Their very irregularity gives a peculiar charm to these pieces, in which one feels, above all, the hand of man.

During the twelfth century there was little change in the fashion of the grille. There were always the uprights in a frame filled in with ornamental scrolls of square or flat iron. Strength was gained by setting the uprights and spirals on edge (Fig. 3) an appearance of lightness by putting them on the flat, showing their broad side to the front (Fig. 4.) In a geometrical drawing exactly the opposite effect is produced.

The architects of the Middle Ages, however, thought rather of the perspective effect of the executed work, and it is clear that the greater part of the grille being seen from an oblique point of view, the iron set on edge develops the greater breadth (Fig. 5a) and strength to the eye, while in that set flat (Fig. 5b) the broad faces diminish in perspective and the narrow edges do not fill up the spaces between the uprights.

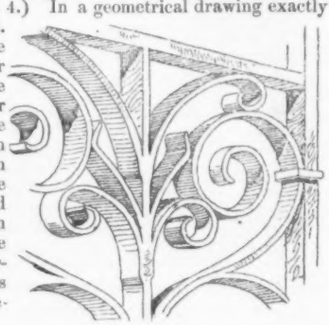

Fig. 5a.

Toward the end of the twelfth century the ironworkers, seeking new combinations, produced some great designs by the grouping together of ornamental panels in grilles delicately wrought of light iron. M. Didron has a

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Nave of St Etienne du Mont. Paris. France

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Church of S. Maria de l'Antigua. Valladolid Spain

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PROPOSED SEA SHORE HOUSE

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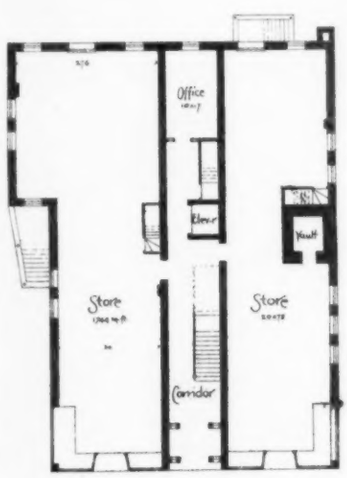
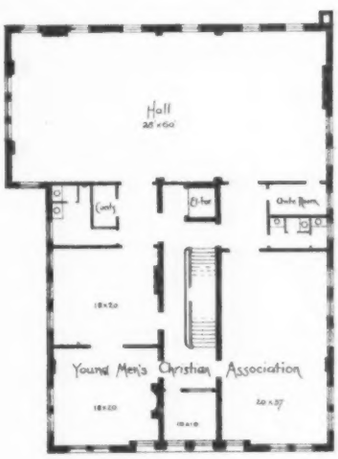
Building at Woburn, Mass.
for the
Woburn Five Cents Savings Bank.
Jos. R. Richards
Wm. A. Richards } Architects.



FIRST FLOOR

SECOND FLOOR



THIRD FLOOR

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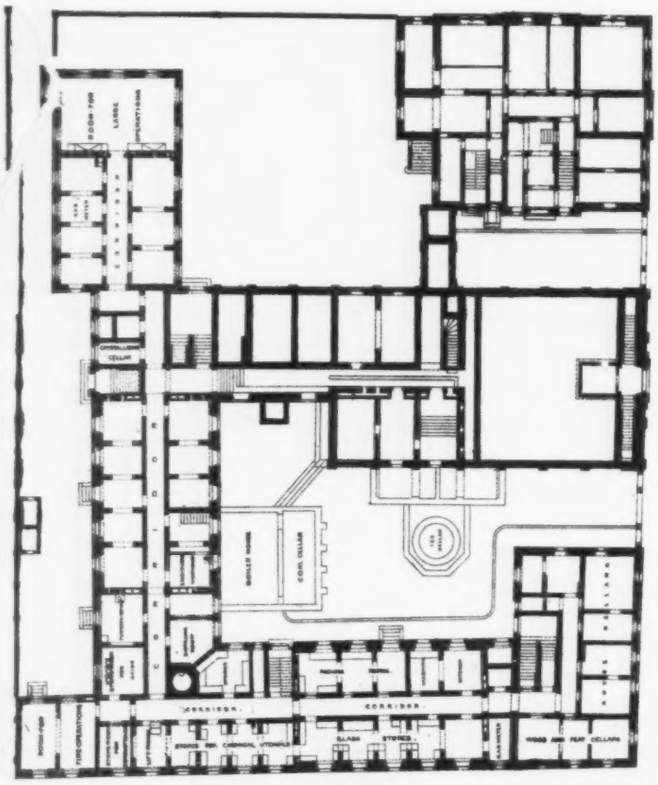
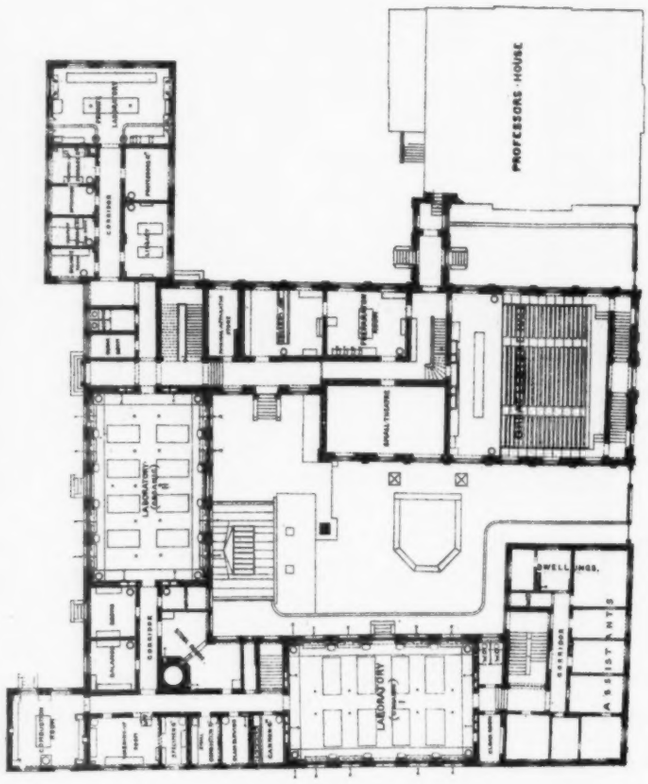
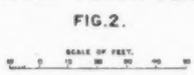
MUNICH UNIVERSITY · CHEMICAL LABORATORY.

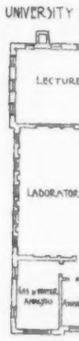


BASEMENT FLOOR PLAN.
FIG.1.

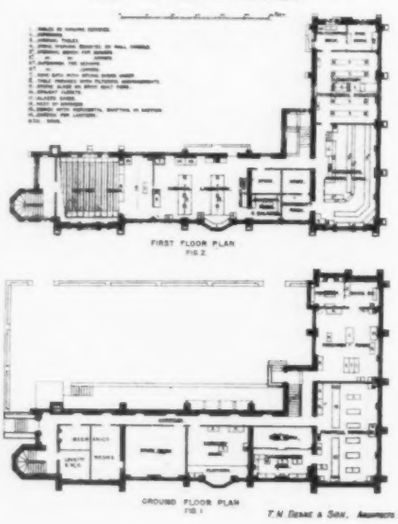


GROUND FLOOR PLAN
FIG.2.





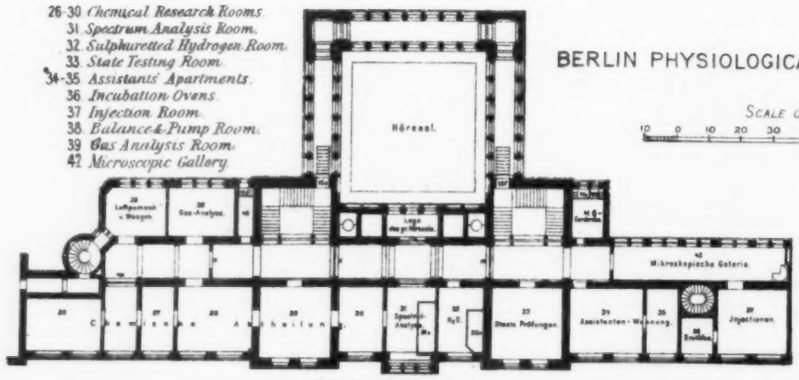
OXFORD PHYSIOLOGICAL LABORATORY PLATE 33



FIRST FLOOR PLAN
FIG.2.

GROUND FLOOR PLAN
FIG.1.

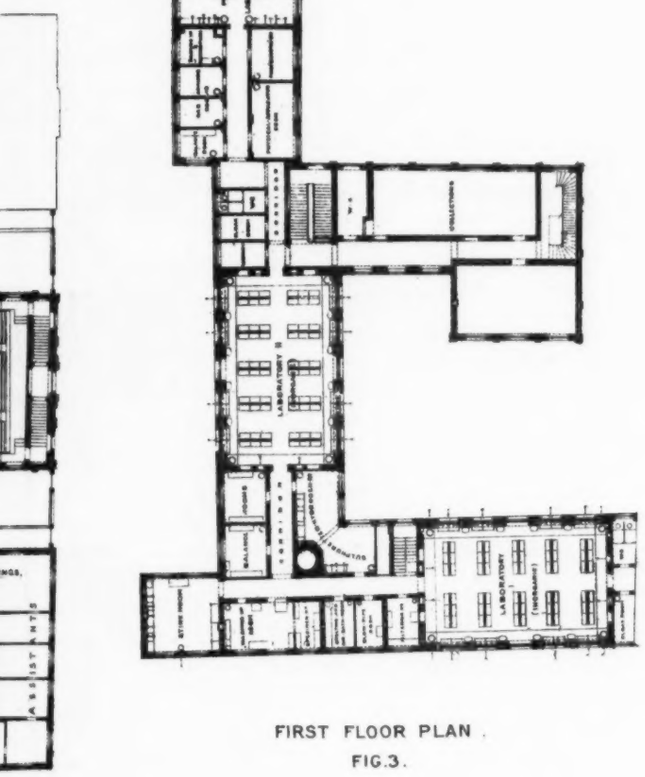
T.N. DEANE & SON, ARCHITECTS



BERLIN PHYSIOLOGICA

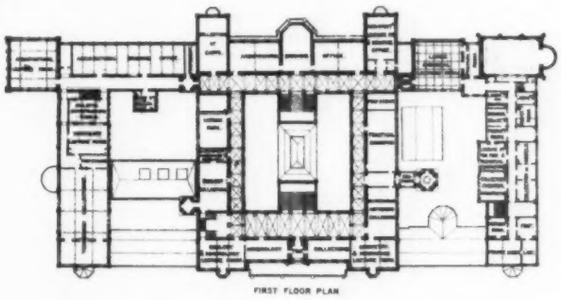
FIRST FLOOR PLAN.
FIG.3.

BY TIERNON & Co

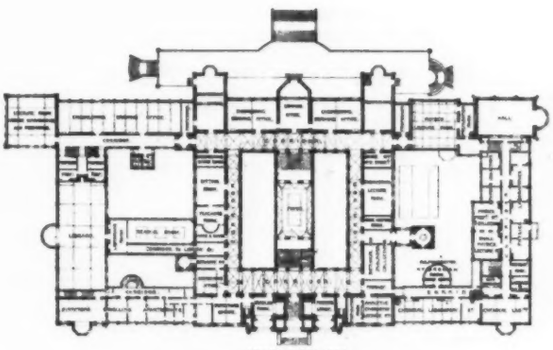


FIRST FLOOR PLAN.
FIG.3.

HANOVER TECHNICAL HIGH SCHOOL

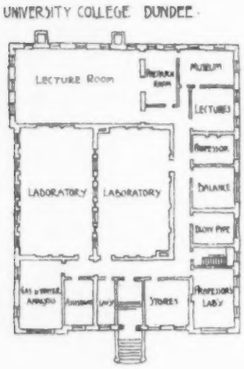


FIRST FLOOR PLAN



GROUND FLOOR PLAN

UNIVERSITY COLLEGE DUNDEE.

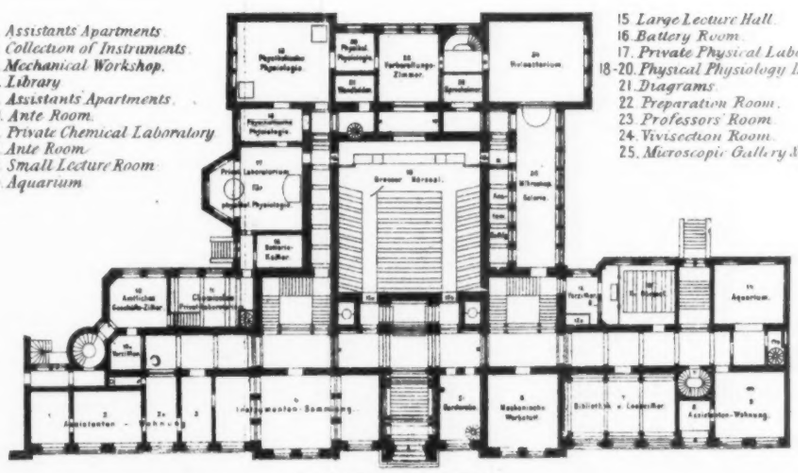


SIOLOGICAL INSTITUTE.

SCALE OF FEET.

1-3. *Assistants Apartments.*
4. *Collection of Instruments.*
6. *Mechanical Workshop.*
7. *Library.*
8-9. *Assistants Apartments.*
10. *Ante Room.*
11. *Private Chemical Laboratory.*
12. *Ante Room.*
13. *Small Lecture Room.*
14. *Aquarium.*

15. *Large Lecture Hall.*
16. *Battery Room.*
17. *Private Physical Laboratory.*
18-20. *Physical Physiology Laboratory.*
21. *Diagrams.*
22. *Preparation Room.*
23. *Professors' Room.*
24. *Vivisection Room.*
25. *Microscopic Gallery & Anatomical Collection.*



GROUND FLOOR PLAN.
FIG.2.

Heliotype Printing Co. Boston.

very beautiful example of such work, illustrated in the "*Annales Archéologiques*," which may with certainty be assigned to the end of the twelfth or the beginning of the thirteenth century.

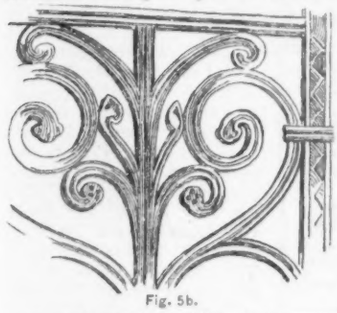


Fig. 5b.

Grilles of scroll-work with their simple incised enrichments seemed, to the twelfth century smiths, not of sufficient richness of design for use in churches and important civil edifices, and by degrees they began to further finish the scrolls with ornaments impressed upon the heated metal with a stamp or mould of tempered iron.

In the Abbatial Church of St. Denis there may still be seen what is left (Fig. 6) of some very beautiful grilles of this description. They date from the end of the twelfth century, and were forged with such rare skill that the iron seems to have been brought under the hammer of the smith to the malleability of lead. The ornaments are stamped on one face only.

Grilles composed of ornamental panels set between the uprights and cross-pieces were at once light and strong; the panels, sometimes simple, sometimes generously enriched, could be taken out, repaired and put back easily. The uprights were sometimes covered with overlapping plates which formed grooves into which the panels were fastened.

Sanctuary grilles were occasionally made in this way — there is a beautiful example of the kind in the choir of the Abbatial Church of St. Germer — and fragments are discoverable everywhere in numbers which indicate that work of the sort was by no means rare. Cabinets of precious articles, reliquaries, tombs and shrines were sometimes enclosed by grilles of extreme richness and beauty, and the most perfect examples of this kind belong to the thirteenth century, when the art of the smith achieved its greatest triumph. These grilles were decorated only on the exterior surface, and the spirals, instead of being enclosed between the uprights and the cross-pieces, were often applied to the outer face of the frame. The tomb of Queen Eleanor in the choir of the Abbatial Church of Westminster is protected by a very beautiful grille of the kind described, and there are in the storehouses of the imperial Church of St. Denis fragments of grilles forged and joined in this manner (Fig. 6b.) which had the advantage of greatly strengthening the simple framework of uprights and traverses. The finely forged scrolls were retouched with a graver and riveted to the iron frames, to which they added great richness as well as stiffness.

Fig. 6. From the Abbey of St. Denis.

Grilles for the defense of treasures, sanctuaries, rich tombs or precious reliquaries sometimes fairly bristled with points and unscalable spikes. One (Fig. 6c.) in the sanctuary of the Church at Conques (Aveyron), which is not over 1.40m. high with the crown pieces, has projecting barbs fastened to the outside of each upright, the uprights being further armed with nicely forged iron points, and the barbs terminating in little dragon heads, which seem to be keeping guard over the sanctuary. This curious grille is described and geometrically drawn in the eleventh book of M. Didron's "*Annales Archéologiques*"; it apparently dates from the end of the twelfth century, or the beginning of the thirteenth. In the Romanesque windows of the Church of Brède (in the Gironde) there may still be seen some interesting twelfth-century grilles, whose workmanship is very straightforward and effective.

The windows are 0.26m. wide and 0.90m. high. The guard consists of a single vertical bar of iron. (Fig. 7.) 0m. 03. square, with cross-pieces fixed like pins through the enlargements of the bar. The cross-pins are flattened, 0.02m. by 0.007m., and scrolls of flat iron, 0.03m. and 0.004m. are pierced and held in place by them. The bar is sharpened at its upper end and set into the keystone of the arch, while the lower end is fashioned into a *queue de carpe*, or fish-tail, to give it a good fastening. There is no welding but simply a combination, in the most natural way, of small pieces of iron.

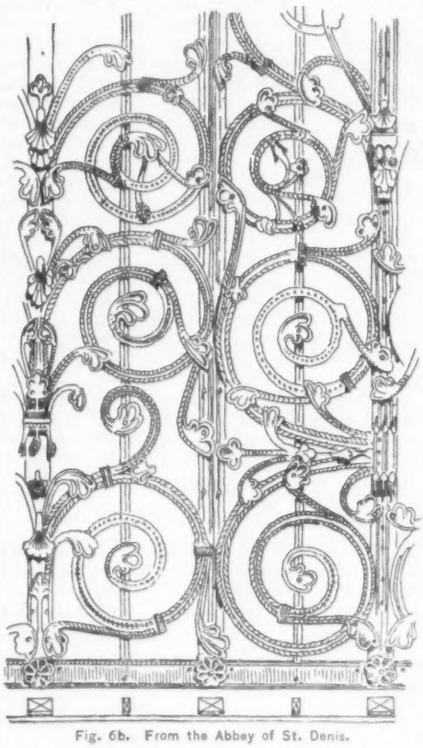


Fig. 6b. From the Abbey of St. Denis.

Certain other thirteenth-century grilles (Fig. 8) are made of vertical bars of flat iron, 0.035m. by 0.02m., with keys piercing them and riveted in the form of a cross. (Maison à St. Antoine, Tarn et Garonne.) The rivets are squared to prevent the keys slipping.

A very beautiful fan-light grille, discovered at Agen (Fig. 9), Rue St. Antoine, by M. Alaux, an architect, now decorates the arched door-way of a house of later date. The centre of the grille is lost; the remainder fills a complete half-circle of 1.60m. diameter. Six panels shaped like voussoirs fill the arch, and are held in place by two half-circles and seven radial bars, the panels being formed of scrolls or tendrils of iron 0.008m. square, welded with light pieces in the manner used by smiths of the thirteenth and fourteenth centuries.

An example is given of the decoration of grilles with stamped ornaments. In this case the irons are stamped and ribbed upon their flat sides; the ornamentation of the narrow sides or edges of the scrolls, a feat frequently accomplished by the thirteenth-century smiths, was a more difficult process.

There are in the Church of Braine, near Soissons, some portions of a grille (Fig. 10) of very charming design forged as above described. Very light in appearance, an effect caused by the presentation of the edges of the irons, such grilles yet have great stability. The work in the panels is of a difficult character, the irons being stamped on two sides. The thickness of the edge diminishes considerably toward the extremity of each limb, and the ornaments are confined to that reduced thickness.

Fig. 6c. From the Church at Conques.

Meanwhile, the art of the smith in France was not at a standstill, and was, on the contrary, continually seeking new methods, new forms of expression. In the beginning of the fourteenth century the stamped ornamentation of grilles and the method of putting together without welding as seen in those of St. Denis, St. Germer, St. Aventin — see Gailhabaud's "*L'Architecture du V^e au XVII^e Siecle*

et les arts qui en dépendant" — were no longer in vogue. Other combinations were sought, plaques of hammered iron cut out and modelled, taking the place of designs stamped in the full iron. The smith now aimed for more effect with less labor. The iron industry was advanced, the art was lost. Rivets replaced shoulders and collars, and even supplanted weldings, the tendency being

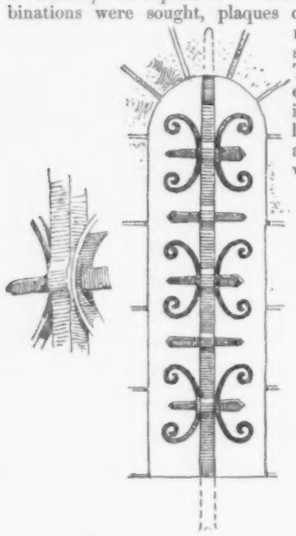


Fig. 7. From the Church of Brede.

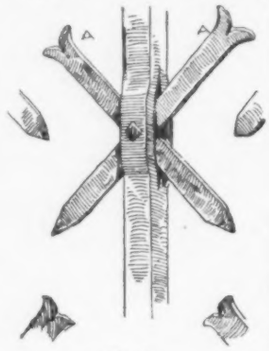


Fig. 8.

toward cheap and quick work. In the processes of handling and firing iron, the artificers of that day were far in advance of the workmen of our time, and the most remarkable qualities of their pieces of delicate workmanship are the evenness of the execution and the maleability remaining in the metal. The iron of the ancient grilles, although it must have passed through the fire a great number of times, is never burned; it retains its flexibility and the weldings are made with a perfection, and at the same time a freedom, very rarely found to-day.

Fig. 9. Fan-light at Agen.

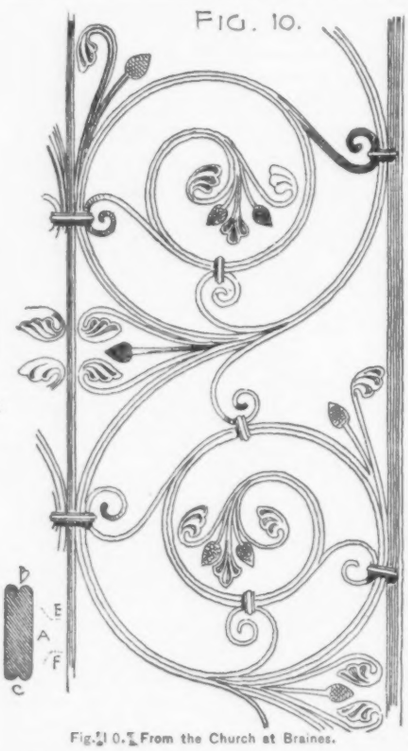


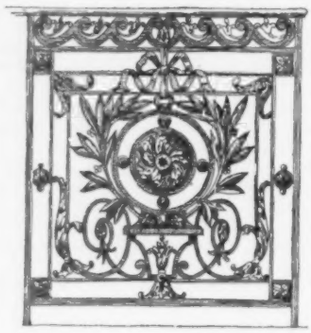
Fig. 10. From the Church at Braines.

[To be continued.]

Inscriptions on Buildings in Paris. — He that runs may soon read a good deal of biographical history on the walls of houses in which famous men were born and died. The Committee on Parisian Inscriptions has just drawn up seventeen, two of which are on the asylum for the deaf and dumb. The first of the two states that the Abbé de l'Epée began his self-appointed mission to the deaf and dumb in 1760, and opened a school for them in a house now demolished in the Rue des Moulins, where he died, surrounded by his pupils, on December 23, 1779. The second, which runs as follows, is from a decree of the National Assembly, dated July 21, 1789: "The name of the Abbé de l'Epée, founder of this asylum, will be placed in the list of those citizens who have best deserved of their nation and of the human race." The committee has decided to place a slab on each public building, whereon will be inscribeda brief account of its history. — *London Daily News.*

PARIS GOSSIP.

Paris, October 26, 1887.



Wrought Iron Balcony
M. Thiriot, Archt. Paris.

The fortnight which has just passed has been quite interesting so far as exhibitions are concerned. We have had at the School of Fine Arts the Attainville competition and the *envois* of the pensioners at Rome, and at the Gallery Georges Petit, a very curious exhibition of contemporary engravings. I shall say very little of the Attainville historical and landscape painting. It was very weak. The prize of 2,100 francs was not awarded to any of the competitors. The subject for the historical painting was the decoration for the background of a gallery in a small museum. The bust of the artist who founded the prize was to occupy the middle of one of the panels, and all the *motifs* of decoration were indicated in the programme. There was not a shadow of an opportunity left to the imagination of the competitors. The work was to be highly colored, the pilasters and sub-basement being in variegated marbles.

As may be seen, architecture held a specially-important place in the competition. Alas! can the name of architecture be applied to what was laid before us? Either the competitors are very young, or if it is absolutely necessary to give such subjects for painters to treat, much more elementary notions about columns, capitals, arches, entablatures and simple mouldings should be first instilled into them. The unfortunate artists never had a misgiving. One cannot picture a similar exhibition of inexperience. I make an exception in favor of M. Duffet, who obtained a mention. His was certainly the most decorative design, having a certain amount of brilliancy in color and a fairly-good arrangement of the architecture, better studied, although very *naïf*. Two mentions were awarded to MM. Daudin and G. Roussel Why, I cannot imagine. The competition in landscape was not much better. The subject, nevertheless, was attractive. The competitors were asked to interpret these pretty lines of Millevoye:

De la dépouille de nos bois
L'automne avait jonché la terre.
Le bocage était sans mystère
Le rosignol etait sans voix.
Triste et mourant à son aurore
Un jeune malade à pas lents
Parcourait une fois encore
Le bois chers à ses premières ans.

An artist had a very pretty chance, with such a subject, to show us a young invalid amid a melancholy, autumn, country landscape, full of sentiment and reverie. Alas! once more alas! where, in the works shown, is there any trace of sentiment or reverie? Perhaps a little in the canvas of M. Blanchecotte, the general tone of which was good, but a little too uniform, too gray. M. Blanchecotte had a mention. Perhaps he would have won the prize if he had borrowed from his comrade, M. Signoret, who also got a mention, some of his lifelike tints of dead leaves. Mention was also awarded to M. Bellet, whose very able and decorative landscape showed us a pretty effect of the setting sun reflected in a lake, but no bit of sentiment.

Let us pass next to the Roman paintings. The painting was ordinary enough, nothing absolutely bad, but, on the other hand, nothing very good. The most important work is the Ste. Praxine of M. Popelin, a fourth-year pupil. The body of the young martyr, Ste. Praxine, has been cast into a pit in the midst of other corpses, but is not affected by decomposition. In this canvas there were certain qualities of composition: the body of Ste. Praxine, the principal figure, is clearly of the first importance, and attracts immediate attention. It is covered with a luminous white robe, too white, in fact, since the scene is laid in a cave, where the colors must be sombre. Perhaps the preservation of the body of Ste. Praxine is facilitated by the absence of the body itself, for only with great difficulty can one detect it under the gown which covers it. In any case, it is too flat, though the painting is good.

M. Baschet, of the third year, sends a copy of a fragment of one of the frescos of the Sixtine Chapel. I do not recall the original,

but the impression one derives from the copy is that it must be treated with great fidelity and absolute correctness.

M. Pinta, of the second year, shows us a Ste. Martha clothed in a magnificent cloak of cloth-of-gold. She holds against her breast a young person clothed only by her red hair. This young girl seems to be quite ashamed of her nakedness, and conceals her face in the bosom of Ste. Martha. The painting is luminous enough, but not very attractive. The nude figure has some bits extremely well modelled, but the pose is not a happy one, for she does not appear to be resting upon her feet, but looks as if she were hanging.

M. Axilette, of the first year, sends two nude figures and one drawing. The two nude figures are both seen from behind, and, unfortunately, have the same pose. One of them, a Diana, of ungraceful movement, but with flesh tints, warm and lifelike; the other a bather, with legs too violet in tone and lacking in equilibrium. M. Axilette ought to give more attention to his drawing.

The sculpture is better than the painting. M. Ferrary, who is in his fourth year, shows a decapitation of St. John the Baptist, which is very fine and attracts strongly. The executioner, standing with head half-hidden by a bit of drapery, showing only the eyes, holds in one hand the hilt of his cimeter and the head of St. John. One feels the energetic physiognomy of this man and his very glance, so powerfully is it rendered. The body of St. John, fallen in a heap at his feet, gives an admirable impression of the inert suppleness of a still warm corpse. By the side of the plaster cast is placed the partly-finished group in marble.

M. Puech, of the second year, shows us the muse of André Chenier: a nude young girl is holding the poet's head in her arms and bestowing a kiss upon his brow. The idea is pretty and graceful, though the interpretation is less so, and does not sufficiently bear out the delicacy of the sentiment, while in this particular the *envoi* of M. Gardet, of the first year, is very charming. This is a very pretty bas-relief in bronze, called "The Idyl," the everlasting idea of a young man and a young girl making love beside a fountain. This is very graceful. The background is a well; the two figures are arranged in very natural position, except that the young man who is almost naked, is a little too primitive in his attire to be grouped with a young girl admirably arrayed in the clothes of a modern peasant girl; and yet the effect is very chaste. M. Gardet sends at the same time a beautiful marble copy of the torso of the Faun in the Museum at Florence, and an important bas-relief in plaster, "*Sursum Corda*," a grand patriotic composition of a sufficiently imposing air.

M. Naudé, medallist of the second year, sends a wax sketch showing a pretty pastoral scene, a design after Bellini, and an engraved medal, "St. Cecile."

Next for the architecture, which ought to be most interesting for us; but once more alas! I shall never be able to understand the use, the interest and the aim of all these studies by the architect pensioners at the Villa Medici. Here are artists who have at the École des Beaux-Arts made the studies which we know; they have in their *ateliers* studied in detail all the beautiful monuments of antiquity, with their columns, capitals, pediments, etc.; they have made there fine designs well studied and carefully rendered. It is on work of this kind that they have obtained their scholarships at Rome. What, then, remains for them to learn? Their trade? I do not wish for the moment to speak of it, though that can be of some use; but it seems to me that even from the point of view of art and grand architectural studies, there might be something else for the winners of the prize at Rome to do than to remain four years in an Italian city spending their time in measuring every leaf of a capital, or the moulding of an entablature, and making the ideal restorations which they send us year by year, which are afterwards buried in the Government storerooms. These studies, evidently very seriously and conscientiously made, represent a considerable amount of time and labor. They have, perhaps, a certain archæological interest, and to entirely suppress them would be a mistake; but it might be arranged that they should not form the most important part of the work of the pensioners. Why should these drawings be rendered with such perfection? Why such neat washes, so "licked" — a colloquial but very proper expression? We know already that the prize men of Rome know how to draw and lay on washes. Why this special sojourn at Rome? The better coronation of their studies at the school would be for them, as for every other architect, to travel and study in every country. Does not France contain as interesting monuments as those at Rome? Are they as well known? Does not the architecture of our ancient churches, palaces and châteaux give opportunity for as interesting and more practical studies than the old façades and porticos and palaces of Italy, however beautiful they may be? Has not Spain also an interesting architecture, and likewise Germany, Belgium and Holland? Let us say at once that all Europe offers from this point of view an interest which we do wrong to neglect; and if the pensioners at Rome, studying the monuments of every country, should bring back drawings and rapid sketches and measured drawings, they would probably derive more profit, and we also. I know that to do this would be a revolution all the more difficult to bring about, that it would overthrow the antiquated habits and regulations of the Institute.

Meanwhile (and we have plenty of time to wait), let us glance at these last *envois*. M. Deglane, pupil of the fourth year, has made a restoration of the Palace of the Cæsars. On eight large frames we see displayed the large plans, which are interesting enough, and façades quite as important as the plans. All this is very firm in drawing and skilful in rendering, and is the result of a great amount of work. Still, I may dare to say that the present state of the façade of the ruins is much more picturesque and agreeable to contemplate than the restorations here shown.

M. Esquié, also of the fourth year, sends the restoration of the Villa Adrian at Tivoli. The façades are more gay and interesting than those shown by his companion. Apart from this slight difference, I might say the same of this as I said of the other.

M. Redon, of the third year, sends a restoration of the great garden façade of the Villa Medici. It is full of bas-reliefs and sculptures, which are very well drawn and rendered. His washed drawing of the Temple of Concord is also very correct.

M. D'Espouy, of the second year, shows two pretty water-color studies of interior decoration from the Campo Santo at Pisa, the Hôtel Via de Clerici at Milan, and the Villa Medici. With these, also, certain perfectly well-known details of sculpture and architecture in India-ink washes. These are absolutely beyond criticism, and are neat beyond expression.

M. André, of the first year, sends some nice drawings. These are less above criticism, and of no great interest.

It only remains for me to beg my readers to keep in mind this description of the architectural *envois*, for if I have the pleasure of speaking of those sent in next year, it will probably be exactly the same thing, and it will only be necessary for them to change those names which I shall point out. M. BRINCOURT.

LIGHTNING.

WINDOW FROM HOUSE AT PERIGUEUX.

THUNDERSTORMS are, as is well-known, much more frequent in summer than in winter. Statistics recently collected in France show that during the three hot months of summer, lightning strokes, whether to animals, trees, or buildings, are by far the most frequent; whilst during the winter months there are few or none. The cause of this is not very apparent; but a German writer has attempted to show, from observation and experiment, that electricity is generated by the friction of water vapor in the atmosphere; the vapor being raised up by the sun's heat. Friction of water particles has been known to generate electricity since the days of Armstrong's electrical machine, in which a jet of steam escaping from a narrow pipe is found to be electrified. The mere evaporation of water may or may not give rise to electricity; the question is at least a doubtful one; but the effect of rubbing of water particles against a mouth-piece is undoubted. There is also reason to believe that the particles striking against each other, or the atoms of the air, also give rise to electricity. The vapor thus charged condenses into floating masses which we term thunderclouds.

Now as a charge of electricity has the property of inducing another charge of electricity of an opposite kind to itself on any "conducting" matter near it, and as the earth is composed of what is called conducting matter, it follows that a charged cloud sailing over the surface of the earth induces an opposite charge on the ground below.

These two opposite charges, one of "positive" the other of "negative" electricity, tend, by another well-known property of electricity, to rush towards each other and combine. Hence when they are able to overcome the resistance of the air between, which keeps them apart, they leap together with a flash and crack, producing the familiar phenomena of thunder and lightning.

It is the old story of the electric spark. When a rod of dry sealing-wax is rubbed with the warm hand or a silk handkerchief, it becomes electrified, and if it is then held near a piece of metal, a tiny spark accompanied by a faint snapping sound will be observed. In this experiment the sealing-wax corresponds to the cloud and the metal to the earth, and the spark which passes between them is the lightning.

Sometimes another cloud floating near the first one takes the place of the earth, and then the lightning flash takes place between them. Lightning of this kind does not strike the earth; but it might have a destructive effect on the latter for all that, because it might give rise to the "back-stroke," which is sometimes fatal to life.

The "back-stroke" is not due to the direct flash and discharge. It is rather the reaction after the direct discharge has taken place elsewhere. Suppose, for example, that a tract of upland country, a rural district with trees, farms, and here and there a church dotting it, is covered by a thundercloud, which induces a charge of electricity upon it. In order that the charge upon the earth may get nearer to that upon the cloud so as to combine with it, the electricity, by another well-known property, will heap itself on the most prominent and pointed objects of the landscape. That is to say, it will accumulate on the trees, barns, chimney-tops and spires of the district.

The whole atmosphere of the region is in a state of tension and suspense. The bolt is trembling in the balance, but no man knows

where it will fall. Presently there is a blinding flash of light, the sky is rent with a lurid stream of fire, and instantly the tension is relieved. The discharge has taken place at one point, the point which offers the path of least resistance through the air, and at which the electric tension was most critical. At every other place where the electricity had seriously accumulated, there is consequently a sudden fall of electric potential, or a collapse to its old condition, or, as it is called, a "return stroke." This instantaneous change is sometimes as fatal as the direct discharge, and it may ruin a building or destroy life several miles from the scene of the flash. The direct stroke is, therefore, more mysterious and unexpected than the flash, but fatal effects are comparatively rare from it. Nevertheless, since the latter have been attributed to this cause, a person cannot feel quite safe, although a thunderstorm with lightning is still several miles from him; the number of miles being estimated by counting the seconds which elapse between the flash and the peal, and allowing a distance of one-fourth mile for every second counted. He may feel safer than if it were close upon him, but there is still room for fear.

In fact there is no real safety except within the area properly protected by a lightning-conductor, or in a building which is itself a protector, for instance, a sheet-iron house. Every building, then, should be protected in order to be safe. In the country, where these are often isolated, a lightning-rod would be required for each; but in towns one rod would sometimes protect more than one house around it, according to its height and conductivity. Lightning-rods, as they are now made of copper, are so expensive that most people prefer to trust their chances of escaping a discharge rather than have their homes protected. Yet a change of feeling in this respect will probably come about in course of time, especially if lightning-rods can be had, as they are likely to be, for a trifling sum. It is important, however, that the rod should be properly planted with a good "earth" connection, and properly run up above the chimney with pointed ends into the air. Although the rod may be a simple affair, for example, two or three twisted lengths of telegraph wire, it should only be applied to the building by a person skilled in the work, or else it may invite instead of warding off destruction.

Thus bare electric-light and telegraph-wires running on poles in the open air have sometimes been taken into buildings carelessly, and by providing a path of less resistance for the lightning to "earth," have brought the discharge down upon the roof of the building. The effect may be more forcibly realized by conceiving a person to carefully plant the bottom of his lightning-rod in connection with the earth and then take the other end indoors, instead of running it outside the house until it cleared the roof.

The flash takes place at the point of least resistance, because it is here that the two opposite electricities can easiest rush together. But the eagerness with which they tend to rush together is another thing to be considered. These two things taken together determine the discharge. There may be less resistance to the flash at one house or tree than at another, but if the attraction between the opposite electricities is less at the former, the flash may traverse the latter house. Hence one cannot exactly say if one tree or building will be safer than another. There is great uncertainty, and this is a reason for the instinct of awe and uneasiness which most animals feel on the approach of a thunderstorm.

In general, however, we can say that high houses, or those perched on high ground, are more likely to suffer from the discharge than small, low-lying houses. The former are, therefore, all the more eligible for protection; and they are to be avoided in seeking shelter from a storm. So are houses surrounded by trees, and with ponds or pools of water close beside them; for trees act as imperfect lightning-rods, having a good earth connection, and especially if they are wet the discharge may strike the house in order to reach the ground through them, or in the case of the pond, through the water. One should not shelter under trees of any kind, but more especially tall soft trees like poplars. Many deaths have been incurred from sheltering under poplar trees in France.

Thunderstorms are said to be more frequent in open, treeless countries such as the Transvaal or the Scottish hills, and the fact has been attributed to the unchecked ascent of electrified vapors; but on the other hand they are probably less destructive in such countries. One fatal accident a few years ago may be remembered by many, that is, the death of Lord Lauderdale, who was killed by the discharge while out grouse shooting. The discharge entered his forehead, and after emerging at his breast left the marks of its passage in two streams down the left leg. The brain and spinal cord being of nervous matter are better conductors than other parts of the body, and hence are not disturbed to the same degree as the latter. The flesh is sometimes rendered livid, and at others quite charred. Curious pink prints, as of arteries and trees, are sometimes left on the skin by the fluid; and watches are fused, clothes singed and boots torn into shreds or pierced through, as happened in the case of Lord Lauderdale. Often death is quite painless, since it occurs before the brain has time to feel; but at other times, as in the Lauderdale instance, it is accompanied by intense suffering. Those who are not killed outright and recover their senses, tell of feeling a heavy blow when the shock came, and the disintegrated and disordered system occasions them severe pain.

Chimneys, by creating currents of warm smoke, and by their lining of conducting soot, are dangerous parts of houses, and there are many instances of the discharge taking that road. It were better, then, to avoid sitting near a fire in a storm. Indeed, the safest place in the house on such an occasion would seem to be in cellar and basement-rooms, or upon an iron bedstead. In the open air, there cannot be a safer place than a dry hole or ditch, for it places the body below the surface of the ground, and, therefore, not exposed on a prominent place. But it should be a dry hollow else the water in it may invite the discharge; for water being a conductor in good connection with the earth, lowers the resistance to the discharge.

Fire-balls are the comedy of lightning, and play the "antic part.' Many singular feats are recorded of them, such as quietly floating down a chimney, and after astonishing the inmates of the room, suddenly disappearing up the chimney with a flash and bang. They are frequently witnessed, and a flash of lightning was seen during the past summer from Westminster Bridge to throw out fire-balls like Roman candles. Nevertheless, the true nature of fire-balls is not at all well known. M. Planté has shown by experiment that they are perhaps the luminous end of a gentle discharge of current electricity passing between a charged cloud and the earth. Both observations and experiments are, however, still required to explain these mysterious vagaries.

Of late years new light has been shed upon the phenomena of thunderstorms; and there are signs of a more systematic study of their effects being instituted. Professor Schuster's recent discovery that air is, comparatively speaking, a conductor of electricity provided it be "polarized" by the passage of another electric discharge, has an important bearing on this subject, and helps to explain the length of some lightning strokes. The experiments of Threllfal on the production of ozone by electric discharges in air, confirms the common belief that lightning freshens the atmosphere; and the results of experiments in depositing dust and vapors by statical discharges from a Wimshurst machine, also strengthen the popular faith in lightning as a purifier of the air. In fact the "smuts" frequently observed when the atmosphere is dull and "thundery" may be a similar effect to what he has observed. Again, the experiments of Professor Hughes on self-induction lead to the conclusion that the best form of lightning-rod is a flat ribbon of copper, or a strand rope of copper or iron, since it has less self-induction than a round rod or wire.

It has also become clear that in order to insure protection by lightning-rods they should be periodically tested by a competent person; and Messrs. Siemens and others now supply apparatus for this purpose, together with the separate insulated wire to the lightning-rod which is necessary to complete the testing circuit. By this means the conductivity of the rod can be ascertained from time to time. Indeed, it is becoming more and more evident that lightning-rods should only be erected by skilled electricians knowing the business thoroughly, and there is some reason to think that the Board of Trade, or at least the insurance companies, should provide that lightning-rods be erected in conformity with the conditions laid down by the Lightning-Rod Committee, or, to speak more correctly, in accordance with the latest results of electrical science.

France has for some time past instituted observations on, and collected statistics of, lightning strokes. Germany has established observatories for studying the same phenomena, and at the recent meeting of the British Association at Manchester the Hon. R. Abercromby proposed a plan for the systematic study of thunderstorms. It will thus be seen that combined action is being brought to bear on this important subject. Already the Germans have discovered that low marshy lands and inlets of the sea are more frequently visited by lightning than dry uplands. There is much, however, to be found out, and the subject, besides having a peculiar interest, is both profitable and humane. — *Engineering.*

COMMUNICATIONS

EFFLORESCENCE ON FURNITURE.

Boston, November 22, 1887.

To the Editors of the American Architect: —

Dear Sirs, — Having read your publication with much pleasure and profit since its inception — although I am not one of those for whom it is specially intended, perhaps — I venture to trespass a moment upon your time, and ask you to help me out of a difficulty if possible.

For fifteen years I have devoted myself to cabinet-work in my leisure hours, much of my information being gained from professional workmen, so that now I am not afraid to undertake any sort of carving, construction or finishing. But I have met a snag, which I have also observed in the work exhibited in one of the foremost furniture houses in town. A year ago I finished with shellac an *ebonized* screen-frame and a *mahogany* picture-frame, using six coats of shellac (*bought new* at a leading store), and finished with 00 sandpaper, and finally with haircloth, oil and powdered pumice-stone, employing no alcohol to wipe dry with. So far, so good. The screen was placed in my drawing-room near a floor-register and the frame hung at the window-end of the same room. Four weeks ago I noticed for the first time a foggy, whitish-gray appearance on both these articles, and I was nonplussed, as many articles in my house, which were years ago treated the same way, are not affected at all.

Both the solvents used in the ebony and mahogany stains were water, which dried before I applied the shellac. I recently saw this unwelcome blemish in a $75-cabinet in a window in town. My inquiries have been without avail, both in stores and shops, where I have many acquaintances. I do not wish to trifle with my work, as it is too good to spoil. Can you suggest a remedy, or, at least, a prevention? You will infer that this is not an idle question from an amateur, and I am perfectly willing to pay for the advice if you can refer me to any one or give it yourselves. Respectfully yours,

W. H. D.

[WE do not find any explanation of this phenomenon, which is not an uncommon one. The indications point rather to some adulteration in the gum shellac or varnish. Unless oiled after finishing, shellac is often affected in this way when wiped with a wet cloth. — EDS. AMERICAN ARCHITECTS.]

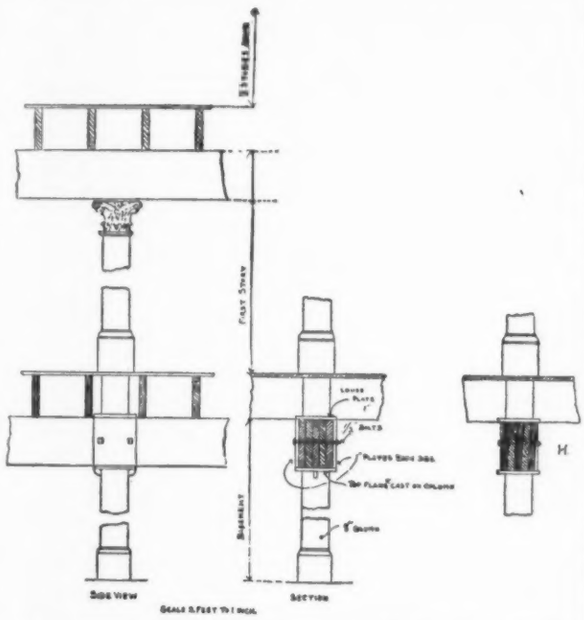
A POORLY-CONSTRUCTED FLOOR.

LOS ANGELES, CAL., October 27, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Enclosed with this you will find a sketch showing the construction used in a large, four-story hotel building in this city, which was complained of to the Board of Public Works by the Chief of the Fire Department — there is no building superintendent here — together with the report of the Building Committee and their expert.

The block has three double stores with this construction used in each exactly as shown by this sketch. The columns carry their portion of three stories and roof above stores included between store



walls, which are some fifty feet apart. The sketch H shows the condition of the built girder in basement in many cases, and how the plates were let into the same in order to make them plumb.

The writer has a decided opinion in regard to the construction employed and its safety, but would like the opinion of the editors of the *American Architect* and any of its readers who are *C. E's.*

Yours respectfully, E. L. C.

REPORT OF BUILDING COMMITTEE.

TO THE HONORABLE THE COUNCIL OF THE CITY OF LOS ANGELES: —

Gentlemen, — Your Committee on Building beg leave to report: —

First, In the matter of the report of the Chief of the Fire Department, as Building Inspector, with regard to the building now being erected on the northeast corner of Main and Fourth streets, that your committee visited the building, in company with the Building Inspector, on the 20th inst., and were afforded every facility for investigating the strength of construction, means of escape in case of, and appliances for extinguishing fire. We found two of the iron columns in the south row in the basement slightly out of plumb. These, though not seriously, if at all, affecting the safety of the building, we advised to have set plumb. In other respects we found the structure strongly and safely built, well provided with means of escape in case of fire, and with fire-hose connections two inches in diameter on each floor and on the roof. We regard the building as creditable alike to the owner and the architect, so far as the above specified qualities are concerned.

The opinion of Mr. W. T. Lambie, C. E., emp'oyed by your committee to inspect the building as to its strength, more especially as to the setting of the iron columns, accompanies this report. The columns have been reset plumb, as advised by your co mittee and Building Inspector, before Lambie's examination.

J. HYANS, M. TEED, E. W. JONES, THOS. GOSS, } Building Committee.

Los Angeles, October 24, 1887.

[THIS seems to us as very dangerous construction; just how dangerous we cannot say without knowing more exactly the dimensions of the top flange of the column, the probable weights on the floors, and other details, but we should not like to stay in the building after the wooden girders had begun to shrink. — EDS. AMERICAN ARCHITECT.]

A QUESTION OF COPYRIGHT.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I have a question of copyright on which your opinion would be of great value to me, and, no doubt, of interest to others.

"B," ignorant of architecture, but in business as an architect, employs "A" as "assistant." "B" becoming short of funds and in debt to "A" for salary, asks "A's" indulgence until he can secure a certain large piece of work. "A" objects to working longer for promises, but finally agrees to design and prepare the drawings on condition that "B," as soon as contract is signed, pays his indebtedness, and in consideration of certain other inducements which "B" offers. "A" sets to work; prepares drawings which are accepted, contracts are signed and the work commenced. "A" then calls on "B" to fulfil his agreements. "B" puts him off by promises for several months, when "A" leaves him.

"A" then has designs copyrighted.

Now, as "A" had to design and prepare the drawings without any aid from "B," and received no recompense from him, cannot "A" hold copyright, and make "B" pay royalty for the use of drawings?

Respectfully yours, S. R.

[WE should not call this a question of copyright, but one of what the lawyers call "master and servant," or of simple contract, according to what the arrangement between A and B might have been. There is no question that A could send his design and have it copyrighted, unless it were a glaring imitation of some other copyrighted design, but we do not think that he could legally take any benefit from his copyright, for the reason that any work which he had done for B, under an arrangement either for a salary or a certain agreed compensation, would belong wholly to B. If this were a real case, we should say to A that by taking the law into his own hands he had not only deprived himself of any chance for getting paid for the services he had rendered, but had rendered himself liable to pay heavy damages to B for the loss which the latter might incur through being unable to avail himself of the drawings at the time he expected to use them; as well as on account of the extra expense and time necessary for having new ones made. It cannot be too carefully kept in mind that if one party to an agreement wishes to have the other keep his promises, he must fulfil his own. For a draughtsman to accept an offer from an architect to make certain drawings, and, after the drawings are made, to copyright them so that the architect cannot use them, is a breach of faith which would certainly justify the latter in not paying for them, and in holding on to any other money that might be due the draughtsman, to go toward making good the damage occasioned by his reckless trick, a trick the less excusable in this case, as A, under the circumstances, could have made sure of payment for his work, as well as for all previous arrears, by the simple process of trusteeing the commissions which B was to receive from his new client. — EDS. AMERICAN ARCHITECT.]

SANDING GALVANIZED IRON-WORK.

SAN FRANCISCO, CAL., Nov. 21, 1887.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Will you please inform me if it is customary in the Eastern States, to sand galvanized ironwork on the fronts of buildings.

I am told by painters here that sand will not stay on galvanized iron, but will come off in flakes; the galvanized-iron men tell me it is done almost always in the East.

I cannot see why the sand should not stay on, as the paint never chips, nor cracks when not sanded. Yours very respectfully,

C. R. WILSON.

[IT is usual to sand galvanized ironwork in New York, and in other places where it is used in connection with freestone. In our experience, the sanded paint clings quite as well as the unsanded to the metal. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

RAILROAD SNOW-SHEDS. — Snow-sheds to cover the railway track have been built at points on the Central Pacific road where it crosses the Sierra. As the trains bound East leave Emigrant Gap they run through one continuous shed for 35 miles. The purpose of the sheds is to prevent the track being buried under falling and drifting snow. They secure this end, but are themselves the occasion of great inconvenience, such as the noise, the loss of view, and confining of the smoke to the train. There is nothing peculiar in the construction of these sheds, which have to support only the burden of the snow. But on the line of the Canadian Pacific, where the road crosses the Rocky Mountains, sheds of a different construction are needed. Before the road was completed observations in the mountains showed that avalanches must be provided against. A single avalanche covered the track for a distance of 1,300 feet, and to a depth of 50 feet. The result of these observations was that the company built 4 1-2 miles of snow-sheds at an enormous expense. The sheds are constructed as follows: On the high side of the mountain slope a crib filled with stones is constructed. Along the entire length of the shed and on the opposite side of the track a timber trestle is erected; strong timber beams are laid from the top of the crib-work to the top of the trestle, four feet apart, and at an angle representing the slope of the mountain as nearly as possible. These are covered over with four-inch planking, and the beams are braced on either side from the trestle and from the crib. The covering is placed at such a height as to give 21 feet headway from the under side of the beam to the centre of the track. The longest of these sheds is 3,700 feet. — *Truckee (Nev.) Republican.*

FIREPROOF CURTAINS IN THEATRES. — Fires in theatres generally commence behind the curtain, and the audience lose their lives in trying to escape from the building before the fire can spread into the front of

the house. If they were perfectly assured that the opening in the proscenium-wall could be closed and the fire confined behind it, they would walk out in an orderly manner, and two ends would be gained: first, there would be no loss of life, and second, the destruction of property would often be reduced. It is strange that with all the regulations and inspections by Boards of Works and by Justices of the Peace, the simple and effectual precaution of a fireproof shutter or curtain capable of closing the proscenium has never been insisted upon as essential. The architect of the Prince of Wales's Theatre (formerly the Prince's) put in a well-designed iron shutter on his own initiative, and there is no doubt that the assurance it gives to the audience, who see it raised and lowered every evening, has been one of the causes of the full houses which have been obtained since the Exeter disaster. Unfortunately, structural considerations prevent the adoption of hydraulically-worked iron shutters at most theatres, and protection has to be sought by simpler means. At the Queen's Theatre, Manchester, an iron-framed asbestos curtain is used, manufactured by the United Asbestos Company, Limited, of Queen Victoria Street, E. C. This consists of a channel-iron frame, with vertical and horizontal bars, held together by cross-bracing, and covered with specially-thick asbestos cloth. The shutter is counterweighted, and runs between guides fixed to the inner side of the proscenium-wall. It is raised by being drawn upwards above the proscenium-opening. Terry's Theatre has a modified form of this curtain, which can be made in different ways according to circumstances. The best plan is to cover both sides of the frame with cloth, leaving an air-space of two or three inches between the two surfaces. In low-roofed theatres, the lower part of the shutter must be hinged to the upper in order that it may be folded up out of sight. A curtain of this kind would probably keep the fire back as long as an iron one of the same general design, but it would not be as effectual in preventing panic, for the public would not put so much faith in it. Further, as it has to be worked by hand, there is a temptation to keep it as light as possible, and thus to decrease the strength of the barrier between the audience and the flames. But as we cannot expect to get framed iron curtains in existing theatres, let us have them of asbestos, which is infinitely preferable to the coiled-iron corrugated shutter which is being introduced. In the United States, the sprinkler-system has been applied in some theatres in such a way that in the event of fire, a sheet of water is discharged from the top of the proscenium, cutting off the burning portion of the building from the auditorium.—*Engineering.*

"Water-hammer" Action in Steam-Pipes a Source of Danger.—On Tuesday, the 25th ult., a fatal explosion occurred at Messrs. Listers' Manningham Silk Mills, near Bradford, from the bursting of a stop-valve in a range of steam-pipes From what can be learned, it appears that, in consequence of the drain-tap not having acted properly, a quantity of condensed water had accumulated in the pipe, and when the engineman came to open the stop-valve, the water was driven forward with such violence by the rush of steam that the upper portion of the valve was blown off and the engineman so severely scalded that he died a few hours afterwards. Several fatal explosions have recently been recorded from the bursting of steam-pipes in consequence of water having been allowed to accumulate in them, and the great importance of keeping the drain-taps open, or, better still, if possible, of so arranging the pipes that water cannot accumulate in them, is not so well understood by boiler-attendants or steam-users generally as is desirable. Some very pertinent remarks on the subject were made by Mr. Peacock, the President of the Manchester Steam-Users' Association, in the course of his address at the recent annual meeting of the Association. Alluding to a very similar case, which had occurred just previously, he said the "water-hammer" action which occasionally occurred in steam-pipes, was of considerable practical importance. As an illustration, he referred to the violent vibration and noise occasionally observed in the tenders of locomotives when standing at railway-stations owing to the driver turning his surplus steam into the feed-tank. This was caused by the rapid condensation of the steam, and, although not precisely similar to the action which occurred in steam-pipes, it served to give an idea of the forces which were in operation. The bursting of steam-pipes from "water-hammer" action was, he said, "by no means infrequent, and could only be avoided by preventing all accumulation of water therein. Should there be any dip in the pipe that rendered the accumulation of water possible, a drain-tap should be fixed thereto and kept open constantly. The water should not be allowed to accumulate and then be suddenly discharged, but the tap should be kept slightly open so as to prevent any accumulation whatever." We may add that we can fully indorse the importance of this recommendation, for we have met with cases in which the attempt to drain off by means of a drain-tap a long, horizontal length of pipe, which had been allowed to get full of condensed water, resulted in such violent "water-hammer" action that the pipe was shivered to pieces.—*Engineering.*

Layard the Explorer.—The following extract from a letter from Lord Strangford, written in 1846 (in "*Lives of the Lords Strangford*," by Fonblanque, p. 257), is of interest: "My principal friend here is a man of the name of Layard, whose history is somewhat romantic. Some years ago, being int he Company's service, he arrived here on his way out. Here he foregathered with a countryman, and these young Delhis started off on foot, with a compass, to see the world. They arrived at Bagdad; one went by the Persian Gulf to Bombay; Layard disappeared, and about three years after reappeared in the ambassador's palace here. He had wandered on foot and alone through the wildest part of Kurdistan and South Persia, and walked back again when tired, in the guise of a Kurd or Arab or some such wild animal. . . . His great passion is ancient and Oriental geography; he is a fair scholar, well up in Herodotus, and a great rooter out of antiquities. . . . He has been all last year at Mossul in the thick of the cholera. His workmen used to die by cartloads. I never spent so pleasant a month as this last, while he was living with me and Hughes. He is a very remarkable man, of the most prodigious knowledge, not of books, but of men, gained by ten years' travel between the Danube and the Indus, without a penny in his pocket, and rising daily without knowing where he would sleep, with his very life hourly in danger. To all this he adds a most correct judgment, much reading and many accomplishments."

Statues raised in France.—Since the establishment of the French Republic, about two hundred statues have been raised in France. This ought to satisfy "the decorated people living in a country of statues," but a proposal has been made for monument-raising on so gigantic a scale that it throws all their previous efforts to commemorate their national greatness and flatter the national vanity completely into the shade. There exist, it seems, two rival committees working for the celebration of the centenary of the Revolution two years hence, but, as Minister of Public Works, M. de Hérédia thinks he is entitled to make a proposal on his own account. Not content with the proposed monumental museum in the Tuileries or the colossal Eiffel Tower, he has calmly suggested to a Ministerial Council that a commemorative monument or column of the Revolution should be erected in every commune in France! As this would mean some 40,000 monuments at one stroke, the Ministers, accustomed as they are to the perpetuation after this manner of the glories of the "*grande nation*," asked time to consider this extraordinary proposal.—*Pall Mall Gazette.*

TRADE SURVEYS

The strongest assurance against a reaction in business circles within a year or two is to be found in the fact that nearly all great industrial operations are in strong hands. Railroad construction and manufacturing operations, as well as land speculations and mining operations, are all conducted by capitalists and syndicates who know what they are doing and who have entered into these operations, calculating upon more or less depression or reaction. Should a depression come they will simply hold on and wait. They will not be obliged, like their predecessors in times of disaster, to sell out and throw their property to the dogs. Having bought land, mineral, timber, machinery, building-material, etc., at low prices, and having invested their money when the rate of interest was low, they feel quite safe in their position. They know, also, that it is only a question of time when a reaction will set in and that an advance in values will eventually take place. America must of necessity be peopled rapidly by foreigners, and this, with the natural growth of population, will create, in the long run, a steady demand for land and its products, for machinery-manufactured products of all kinds, and transportation. They, therefore, feel that it is not only safe but that it is advisable to make the extraordinary purchases and investments at this time. Their efforts must advance real estate, and if one railroad company will not penetrate a new region, another will. It is just this which has done much of the railroad-building, and this is the reason why the standards for railroad-building, which have hitherto prevailed, cannot apply in the future. It is evident that railroad-building in the South and Southwest will be pushed along. The Illinois Central, it is announced, will construct a line from Cairo to Memphis and will add some branches and connections in the South, which will make it a very heavy buyer of everything which goes into railroad construction. Mention is made of several other railroad systems centring at Chicago and St. Louis, which contemplate vast extensions throughout Nebraska, Indian Territory and Texas. This territory will be supplied with railroad facilities, and the investors will wait until the country grows up to it. There is nothing of importance in the steel-rail market apart from the fact that sales since December 1st, so far as reported, foot up about 100,000 tons, but all sales are not reported. Prices are $33 at mill and it is said that this will be the bottom figure at which all large buyers who are now negotiating will be obliged to come in. All branches of the iron trade are in vigorous activity and prices are firm, excepting in nails. The nail-makers are having a severe struggle against over-producing capacity, and perhaps not over 45 per cent of the nail-capacity of the country is at this time engaged. Prices have declined to $2 per keg and less. The heavy crude-iron production is all absorbed, or practically so. In the lumber market a moderate volume of business is being done and prices are stationary. Heavy operations are being drawn to a close, and preparations are being made for active logging operations throughout the Northwest. The demand for yellow pine will in all probability be 25 per cent greater next year than this, although some will be inclined to doubt whether this great increase can be made. A speculation is going on in yellow-pine lands, but no general advance in values will take place within the next twelve months. Architects in New York, Philadelphia and Chicago make very encouraging statements this week regarding the prospects for winter and spring work. A great deal of heavy building is projected in those States as well as in others. Railway-terminal facilities will be extended. A great deal of warehouse room is wanted. Besides this, a great many public buildings and Government buildings will be erected. The coal strike is occupying less public attention owing to the easing up of general demand. Prices are high and the production is about 730,000 tons per week. The bituminous output is very heavy and all buyers are able to secure sufficient to keep their furnaces running. Railroad companies are liberally supplied and domestic requirements are more promptly filled. The builders throughout the country are closing up the year's accounts with a good deal of satisfaction. Plans for the coming year have not been completed very generally, but enough is known to show that a great deal of building will be undertaken as soon as the weather permits throughout the North and that a large amount of work will be pushed along in the Southern States during the winter. It does not appear that there will be much change in the prices of building material. Brick will probably open a little lower than last spring, owing to the purpose of manufacturers to increase the supply as much as possible. Slate will rule a little lower, owing to the heavier production contemplated. Composition material of all kinds will be also a little easier for the same reason. Planing-mill material is now low enough and the combination is endeavoring to advance prices. Lumber will, likely, open strong and continue firm until some unexpected influences will turn prices downward. Lumber combinations are not of sufficient strength or extent to interfere seriously with competition. An immense amount of yellow pine will be thrown into Northern and Western markets. The consumption of hard wood will also be very heavy, and hard-wood dealers in the large Eastern markets state that they will make heavy purchases or contracts this winter for spring and summer requirements. The financial situation is as gratifying as could be expected. Failures continue few in number and the credit of the country is in excellent shape.

S. J. Parkhill & Co., Printers, Boston.